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Hazardous Materials Technical Center

AD-A210 469

INSTALLATION RESTORATION PROGRAM

PRELIMINARY ASSESSMENT

GRANITE MOUNTAIN RADIO RELAY STATION, ALASKA

April 1989

Submitted to:

HQ AAC/DEPV
Elmendorf AFB, AK 99506

Submitted by:

Hazardous Materials Technical Center
The Dynamac Building
11140 Rockville Pike
Rockville, MD 20852

Operated for the Defense Logistics Agency by: DYNAMAC CORPORATION

Corporate Headquarters The Dynamac Building 11140 Rockville Pike Rockville MD 20852 Tel 301-468-2500

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

FIGURES

EXECUTIVE SUMMARY

A. Introduction

The Hazardous Materials Technical Center (HMTC) was retained in January 1988 to conduct the Installation Restoration Program (IRP) Preliminary Assessment of Granite Mountain Radio Relay Station (RRS), Alaska, under Contract No. DLA-900-82-C-4426 with funds provided by Alaskan Air Command (AAC).

Department of Defense (DoD) policy was directed by Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5 dated 11 December 1981, and implemented by Air Force message dated 21 January 1982, as a positive action to ensure compliance of Air Force installations with existing environmental regulations. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the IRP. DoD policy is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites on DoD facilities, control the migration of hazardous contamination from such facilities, and control hazards to health and welfare that may have resulted from these past operations.

To implement the DoD policy, a four-phased IRP has been directed consisting of:

- Preliminary Assessment (PA) - to identify past spill or disposal sites posing a potential and/or actual hazard to public health or the environment;
- Site Investigation/Remedial Investigation/Feasibility Study (SI/RI/FS) - to acquire data via field studies, for the confirmation and quantification of environmental contamination that may have an adverse impact on public health or the environment and to select a remedial action through preparation of a feasibility study;
- Research, Development, and Demonstration (RD & D) - if needed, to develop new technology for accomplishment of remediation; and
- Remedial Design/Remedial Action (RD/RA) - to prepare designs and specifications and to implement site remedial action.

The Granite Mountain RRS Preliminary Assessment included:

- an onsite visit, including interviews with AAC personnel, conducted by HMTC personnel on 12 through 22 July 1988;
- the acquisition and analysis of pertinent information and records on hazardous material use and hazardous waste generation and disposal at the installation; and
- the acquisition and analysis of available geological, hydrological, meteorological, and environmental data from pertinent Federal, State, and local agencies.

B. Major Findings

Past installation operations involved the use and disposal of materials and wastes that were subsequently categorized as hazardous. The major operations of the installation that used and disposed of hazardous materials/hazardous waste (HM/HW) included management of fuel and electrical equipment, maintenance of the facility and vehicles, and use of asbestos as a construction material.

C. Conclusions

Based on information obtained through interviews with Air Force personnel and review of installation records, hazardous materials were used at Granite Mountain RRS while the facility was in operation. Although no evidence of contamination was visible at the time of the site visit, it was common practice at similar facilities to bury drums and waste liquids and these wastes may be present in the solid waste landfill at the RRS. In addition, asbestos may remain within the buildings.

D. Recommendations

No visible signs of contamination are evident at Granite Mountain RRS, however, further IRP investigation is recommended for the facility. The solid waste landfill should be investigated to determine if the wastes it contains are hazardous, and if so, the wastes should be removed and the area remediated

according to state and Federal regulations. Removal of any remaining 55-gallon drums around the runway facilities is also recommended. Temporary fuel storage equipment and fueling operations should be managed to ensure that fuel spills do not occur. Abatement of any asbestos remaining within the buildings is also recommended.

I. INTRODUCTION

A. Background

The United States Air Force, due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, State, and local governments have developed strict regulations to require that disposers of hazardous materials/hazardous wastes (HM/HW) identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The current Department of Defense (DoD) Installation Restoration Program (IRP) policy was directed by Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5 dated 11 December 1981, and implemented by Air Force message dated 21 January 1982, as a positive action to ensure compliance of military installations with existing environmental regulations. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the IRP. DoD policy is to identify and fully evaluate suspected problems associated with past HM/HW disposal sites on DoD facilities, to control the migration of hazardous contamination, and to control hazards to health and welfare that may have resulted from these past operations. The IRP is a basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act (SARA) of 1986.

To conduct the IRP Preliminary Assessment for Granite Mountain Radio Relay Station (RRS), the Headquarters Alaskan Air Command/Directorate of Programs and Environmental Planning (HQ AAC/DEPV) retained the Hazardous Materials Technical Center (HMTC) (operated by Dynamac Corporation) in January 1988 under Contract No. DLA-900-82-C-4426.

The Preliminary Assessment comprises the first phase of the DoD IRP and is intended to review installation records to identify possible hazardous waste-contaminated sites and to assess the potential for contaminant migration

from the installation. The Site Investigation (not part of this contract) consists of follow-on field work as determined from the Preliminary Assessment. The Site Investigation includes a preliminary monitoring survey to confirm the presence or absence of contaminants. Upon confirmation of contamination, additional field work is implemented under a Remedial Investigation (not part of this contract) to determine the extent and magnitude of the contaminant migration and provide data necessary for determining appropriate remedial actions, which are evaluated during the Feasibility Study (not part of this contract). Research, Development, and Demonstration (not part of this contract) consists of a technology base development study to support the development of project plans for controlling migration or restoring the installation. Remedial Design/Remedial Action (not part of this contract) includes those activities which are required to control contaminant migration or restore the installation.

B. Authority

The identification of hazardous waste disposal sites at Air Force installations was directed by Defense Environmental Quality Program Policy Memorandum 81-5 (DEQPPM 81-5) dated 11 December 1981, and implemented by Air Force message dated 21 January 1982, as a positive action to ensure compliance of Air Force installations with existing environmental regulations.

C. Purpose of the Preliminary Assessment

DoD policy is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites and spill sites on DoD facilities, control the migration of hazardous contamination from such facilities, and control hazards to health or welfare that may have resulted from these past operations. HMTC evaluated the existence and potential for migration of HM/HW contaminants at Granite Mountain RRS by visiting the installation; reviewing existing installation records concerning the use, generation, and disposal of HM/HW; reviewing available environmental information; and conducting interviews with present Air Force personnel who are familiar with past hazardous materials management activities at Granite Mountain RRS.

A physical inspection was made of the various facilities and of the suspected sites. Relevant information collected and analyzed as a part of the Preliminary Assessment included the history of the installation, with special emphasis on the history of past operations and their past HM/HW management procedures; local geological, hydrological, and meteorological conditions that may affect migration of contaminants; and local land use that could affect the potential for exposure to contaminants; and the ecological settings that indicate environmentally sensitive habitats or evidence of environmental stress.

D. Scope

The Preliminary Assessment program included a pre-performance meeting, an onsite installation visit, a review and analysis of the information obtained, and preparation of this report.

The pre-performance meeting was held at HQ AAC/DEPV, Elmendorf Air Force Base (AFB), Alaska, on 12 July 1988. Attendees at this meeting included representatives of the HQ AAC/DEPV and HMTC. The purpose of the pre-performance meeting was to provide detailed project instructions, clarification and technical guidance by AAC, and to define the responsibilities of all parties participating in the Granite Mountain RRS, Preliminary Assessment.

The onsite installation visit was conducted by HMTC on 12 through 22 July 1988. The scope of this Preliminary Assessment is limited to the installation and includes:

- An onsite visit;
- The acquisition of pertinent information and records on hazardous materials use and hazardous wastes generation and disposal practices at the installation;
- The acquisition of available geological, hydrological, meteorological, land use, and critical habitat data from various Federal, State and local agencies;
- A review and analysis of all information obtained; and

- The preparation of a report to include recommendations for further actions, if warranted.

The onsite visit, records search, and interviews with Air Force personnel were conducted during the period 12 to 24 June 1988. The Preliminary Assessment site visit was conducted by Ms. Kathryn Gladden, Project Manager/Chemical Engineer; Ms. Janet Emry, Hydrogeologist; Mr. Mark Johnson, P.G./Program Manager; Dr. Naichia Yeh. Other HMTC personnel who assisted with the PA include Ms. Betsy Briggs, Hazardous Waste Specialist; Ms. Natasha Brock, Environmental Scientist; and Mr. Raymond G. Clark, Jr., P.E./Department Manager (See Appendix A). Personnel from AAC who assisted in the Preliminary Assessment included Mr. James W. Hostman, Chief, Environmental Planning (HQ AAC/DEPV); and Mr. Jeffrey M. Ayres, Point of Contact (POC) at HQ AAC/DEPV.

E. Methodology

A flow chart of the Preliminary Assessment Methodology is presented in Figure 1. This Preliminary Assessment methodology ensures a comprehensive collection and review of pertinent site specific information, and is used in the identification and assessment of potentially contaminated hazardous waste spill/disposal sites.

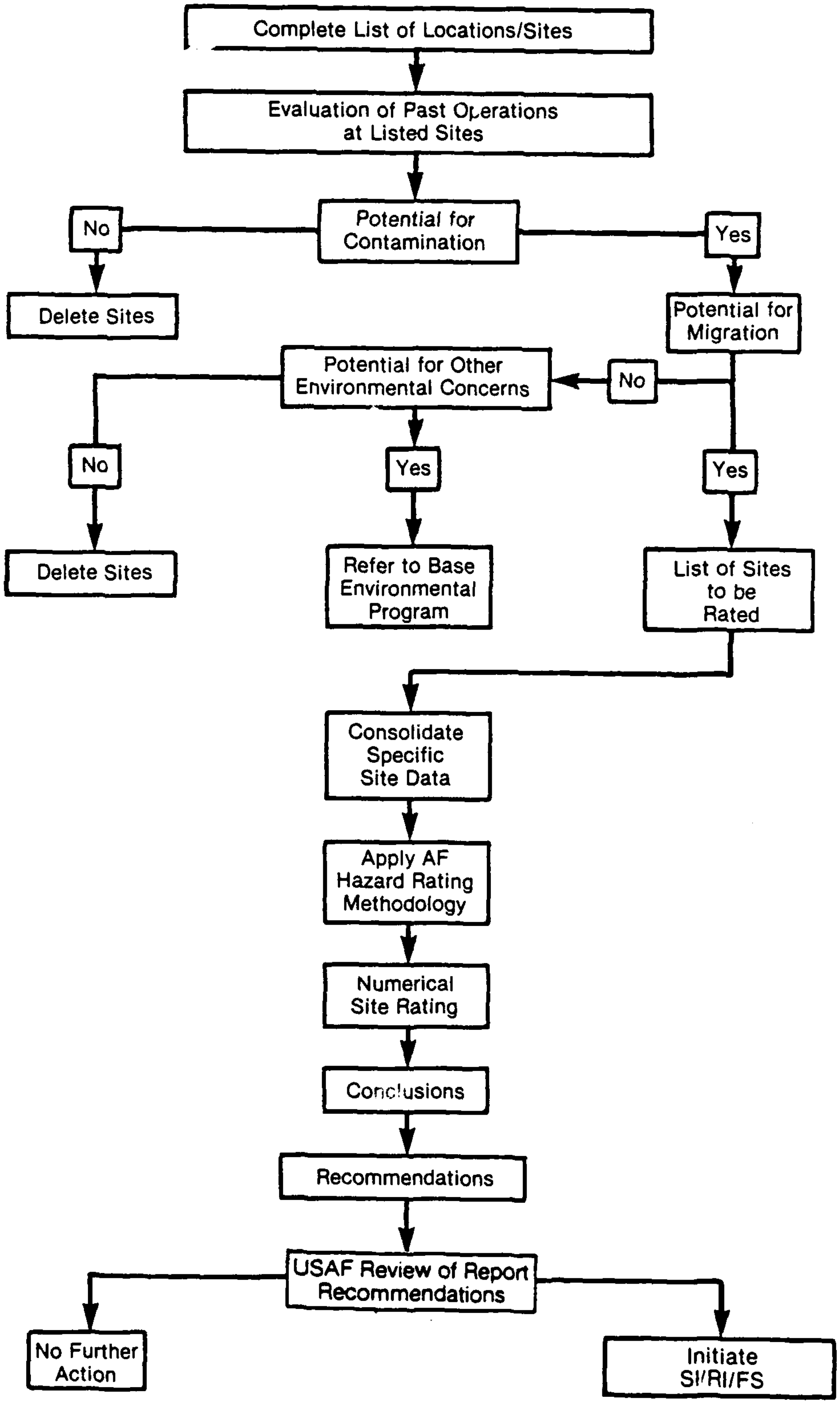
The Preliminary Assessment begins with a site visit to the installation to identify all potential areas where contamination may have resulted from the use or disposal of HM/HW. Next, an evaluation of past HM/HW handling procedures at the identified locations is made to determine whether environmental contamination may have occurred. The evaluation of past HM/HW handling practices is facilitated by extensive interviews with Air Force personnel familiar with the various past operating procedures at the installation. The interviews also define the areas on the installation where any waste materials, either intentionally or inadvertently, may have been used, spilled, stored, disposed of, or released into the environment.

HMTC PRELIMINARY ASSESSMENT
INSTALLATION
RESTORATION PROGRAM

Figure 1.

Preliminary Assessment Methodology Flow Chart.

DECISION TREE



Historical records are collected and reviewed to supplement the information obtained from interviews. Using the information outlined above, a list of past waste spill/disposal sites on the installation is identified for further evaluation. A general survey tour of the identified spill/disposal sites, the installation, and the surrounding area is conducted to determine the presence of visible contamination and to help assess the potential for contaminant migration. Particular attention is given to locating nearby drainage ditches, surface water bodies, residences, and wells where they are present.

Detailed geological, hydrological, meteorological, land use, and environmental data for the area of study is also obtained from the POC and from appropriate Federal, State and local agencies. A list of outside agencies contacted is in Appendix B. Following a detailed analysis of all the information obtained, sites are identified as suspect areas where HM/HW disposal may have occurred. Evidence at these sites suggests that they may be contaminated and that the potential for contaminant migration exists. Where sufficient information is available, sites are assigned a Hazard Assessment Score (HAS) using the U.S. Air Force Hazard Assessment Rating Methodology (HARM) and the HARM guidelines (Appendix C). However, the absence of a HAS does not necessarily negate a recommendation for further IRP investigation, but rather may indicate a lack of data.

II. INSTALLATION DESCRIPTION

A. Location

Granite Mountain RRS is located on the isthmus of the Seward Peninsula north of Norton Bay, approximately 130 miles east of Nome and 12 miles north of Dime Landing, within the Second Judicial District, Alaska. The RRS is located in Sections 1, 11, 12, and 14, Township 1 South, Range 13 West, Kateel River Meridian. The 257.77 acre installation is comprised of a 16.07 acre main site, a 206.61 acre, 4,000 feet long gravel runway, a well site, and an access road approximately 3.2 miles long with a water line right-of-way (Figures 2 and 3).

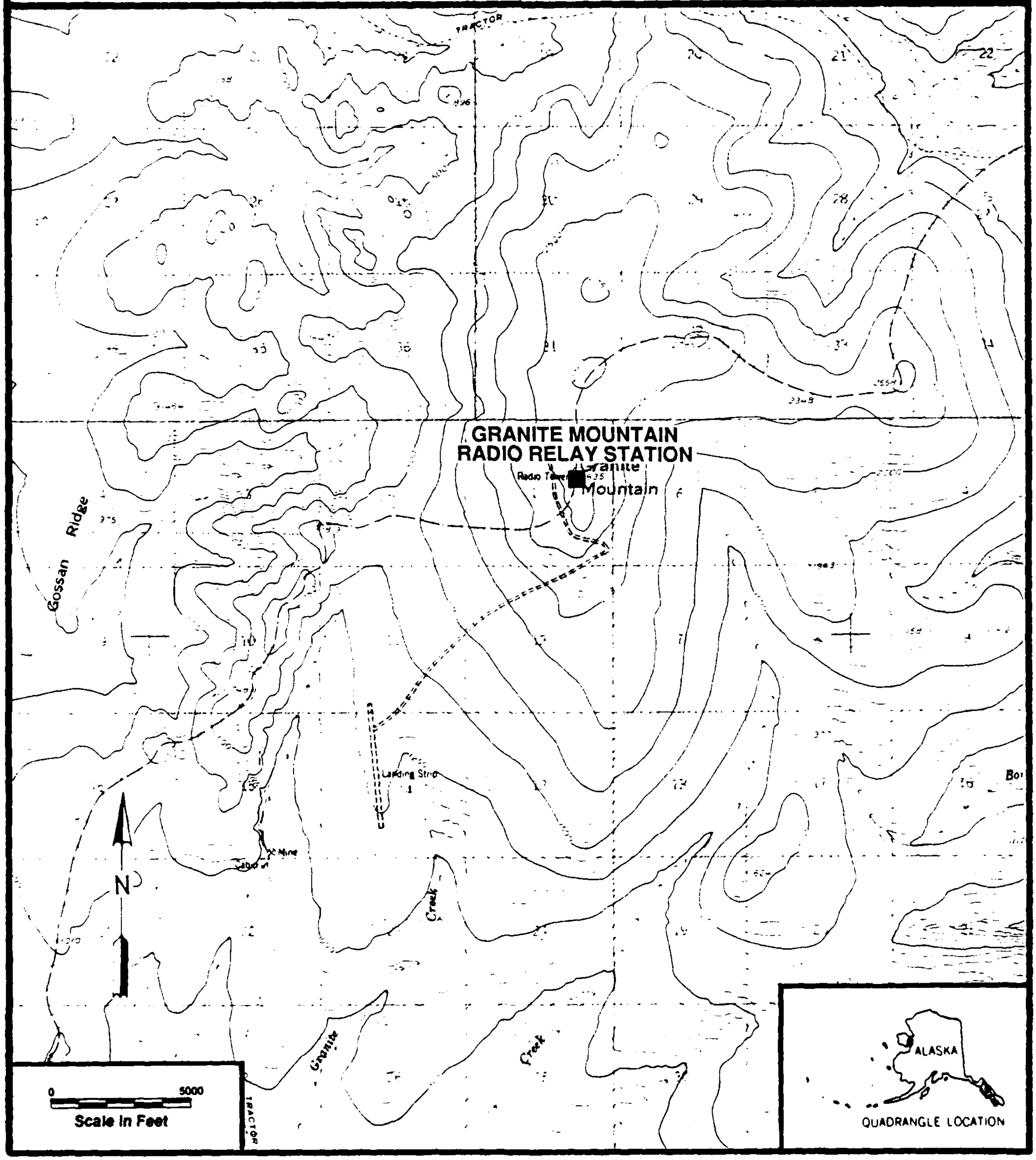
The RRS is located in a remote mountainous area. The closest residence is a cabin located 200 to 300 yards west of the runway. There are an additional three cabins located approximately 20,000 feet (3.8 miles) southwest of the RRS. Since the production of the map in 1973, two more cabins have been built just north of the first one. Residential population is calculated using the USGS Candle (B-5) Quadrangle 7.5 minute topographic map and assuming each dwelling unit has 3.8 residents (47 FR 31233). Therefore, the total population in the vicinity of Granite Mountain RRS is estimated to be 11.

The main site is comprised of seven industrial buildings and 14 miscellaneous facilities including a 13,611 square feet (SF) composite building, a 2,050 SF vehicle maintenance shop, a 1,408 SF vehicle heated parking facility, a 2,004 SF dorm annex, a small fire station, a water supply building, two 30-foot high disk antennas, four 60-foot high tropospheric antennas, two fuel oil storage tanks, and one water storage tank (Figure 4). The runway facility includes a fuel storage tank and associated piping, an auto storage building, an air terminal building, and a storage shed immediately east of the auto storage building.

Source: U.S,G.S. Candle (B-5) Quadrangle, Alaska, 7.5 Minute Series Topographic Map, 1973.

Figure 2.

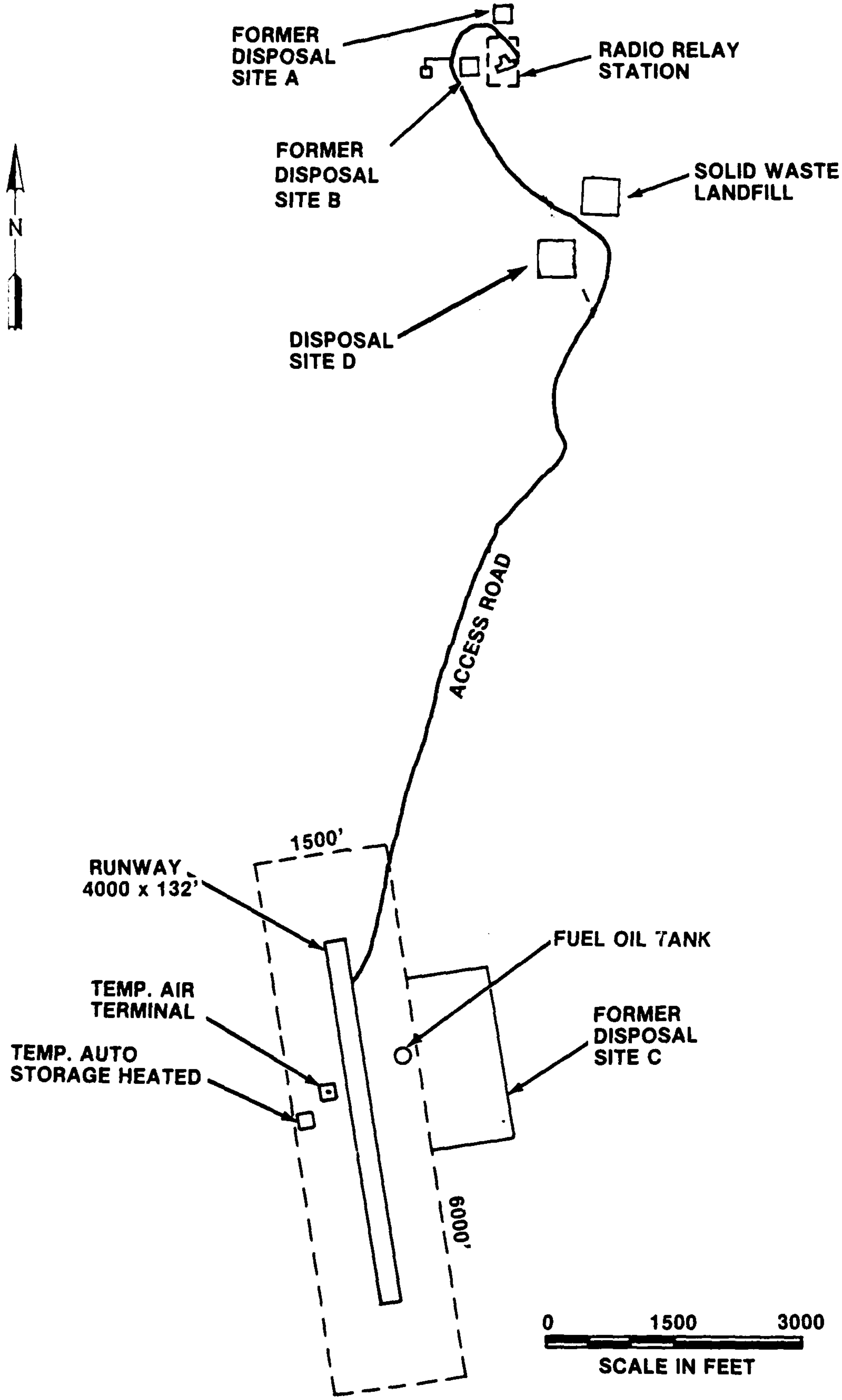
Location Map of Granite Mountain Radio Relay Station, Alaska.



HMTC Source: HMTC, Undated

Figure 3.

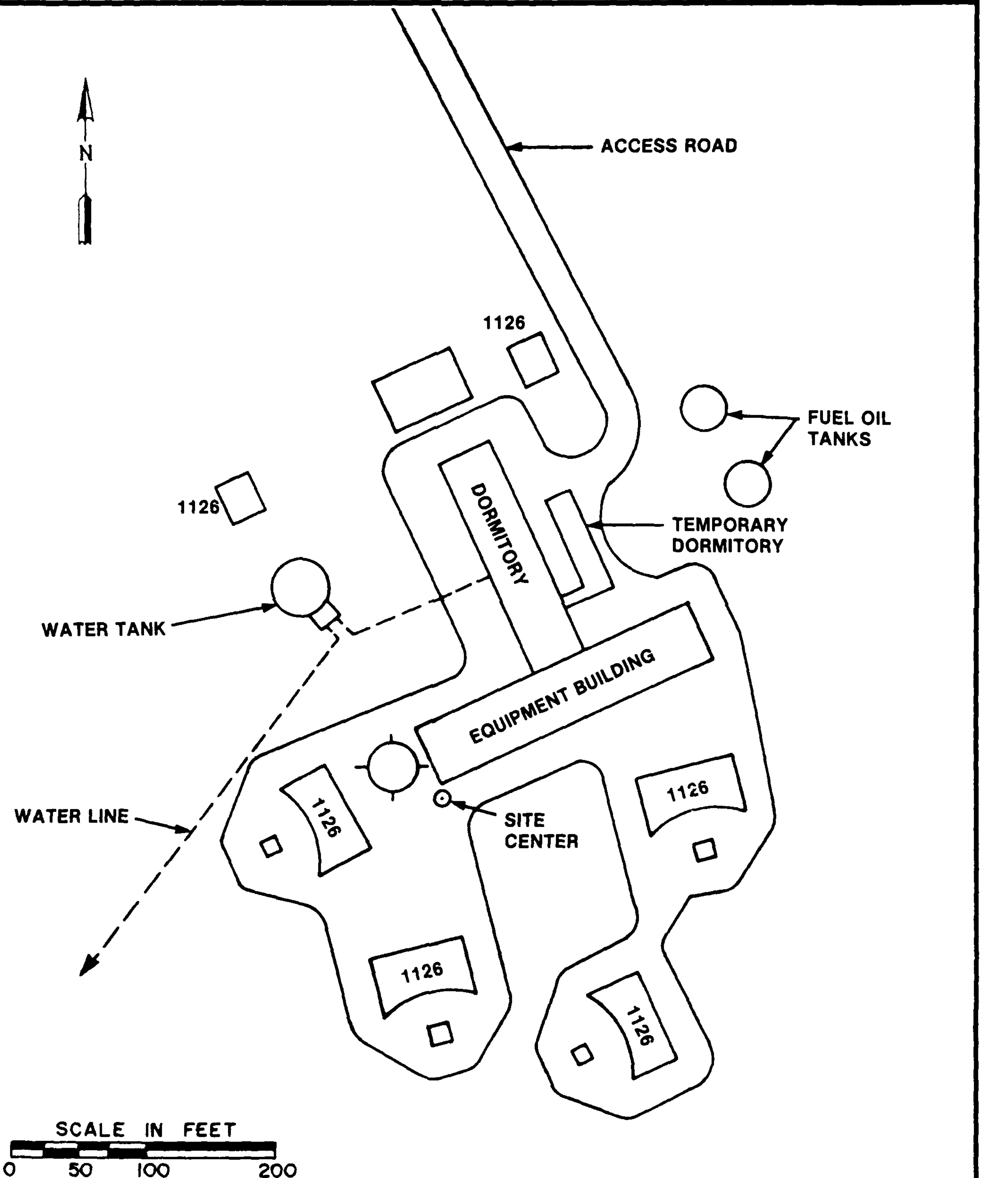
Site Map of Access Road and Runway at Granite Mountain Radio Relay Station, Alaska.



HMTC Source: HMTC, Undated

Figure 4.

Site Map of Granite Mountain Radio Relay Station, Alaska.



B. History

A contract was awarded in 1955 to construct the original 31 White Alice Communication System (WACS) sites. These sites enabled the Aircraft Control and Warning (AC&W) system sites to link with the Distant Early Warning (DEW-line) system and form a cohesive network relaying information back to Elmendorf AFB and Eielson AFB. Two routes linked the Ballistic Missile Early Warning Site (BMEWS) at Clear AFB to the North American Air Defense (NORAD) headquarters in Colorado (Reynolds, 1988).

Granite Mountain RRS was under construction in 1956 and 1957. The RRS was activated on 25 May 1957. This RRS was a combined tropospheric scatter/TD-2 microwave station. It provided links to: North River RRS, 108 miles away, with two 60-foot antennas; Anvil Mountain RRS, 130 miles away, with two 60-foot antennas; and Kotzebue RRS, 105 miles away with a pair of 30-foot dish antennas (Reynolds, 1988).

The 31 stations, including Granite Mountain RRS, were becoming obsolete during the late-1960s with the development and implementation of satellite communication systems. Granite Mountain RRS was leased to Alascom in 1976. On 3 June 1981, a notice of intention to relinquish Granite Mountain RRS was forwarded to the Bureau of Land Management (BLM).

The 5099th Civil Engineering Operations Squadron (CEOS) performed cleanup operations at Granite Mountain RRS. The RRS was cleaned of PCB liquids and transformers in 1980 and again in 1983 to remove additional PCB liquids and hazardous wastes (LeFrancois, 1985).

Final cleanup operations were conducted by the 5099th CEOS during the period of July through September 1985. HM/HW were removed from two disposal areas near the communications facility (disposal areas A and B) and one disposal area east of the runway (disposal area C). Approximately 500 55-gallon drums containing various volumes of liquids were discovered and removed from disposal area C, east of the runway. Approximately 200 55-gallon drums were discovered and

removed from disposal area B, located 500 to 1,000 yards southwest of the communications facility. Approximately 1,100 55-gallon drums were discovered in disposal area A, located 500 to 1,000 yards north of the communications facility. The contents of these drums were sampled and analyzed on site for PCB contamination and removed to Elmendorf AFB (5099th CEOS, 1985).

According to records maintained by the 5099th CEOS, other materials that were identified at disposal area A, north of the facility included:

- 2 tractor chassis
- 1 freezer
- 10,000 feet of 3-inch galvanized pipe
- 8,000 feet of galvanized electrical conduit
- Furniture
- 10,000 feet of electrical cable
- 75 old tires
- 10 radio antennas
- 80 tons of miscellaneous equipment including auto parts and scrap iron
- 2 TD 21 bulldozer tracks
- 12 truck and grader chains
- 15 tons of scrap wood
- 1,400 square feet of aluminum siding
- 18 "truck loads" of trash from buildings
- 5 "truck loads" of insulation from water storage tanks
- 25 tons crusted, miscellaneous, varied, and unrecognizable trash

Other materials identified at disposal area B, southwest of the facility included:

- 8 antennas
- 2 tons of scrap wood
- 200 feet of electrical cable
- 20 tires
- Aluminum siding (quantity unknown)

These materials, from both disposal areas A and B, were excavated and placed in a new landfill (disposal area D), located on the west side of the access road adjacent to the preexisting solid waste landfill (5099th CEOS, 1985).

In addition to the clean up operations at the various disposal areas, small quantities of materials were also removed from within the buildings and shipped offsite including:

- Lube oil
- Compressor oil
- Form oil
- Metal conduit compound
- Magnesia cement
- Thimerosol tincture
- Asphalt primer
- Creosote
- Rust removing compound
- Grease
- Alcohol
- Neoprene (liquid)
- Potassium hydroxide
- Laundry bleach
- Cleaning compound
- Cement (flammable liquid)
- Concrete sealer
- Glass cleaning compound
- Asbestos furnace cement
- Sulfuric acid
- Boric acid
- Etching acid
- Hydrochloric acid
- Hydrogen peroxide

The cleanup operations at Granite Mountain RRS were documented in a "Finding of No Significant Contamination" and a "PCB Clearance Certification." Copies of these documents are included in Appendix D.

Currently, BLM utilizes various facilities at the site during the summer months as a headquarters site for firefighting operations conducted in the interior of Alaska.

The Federal Aviation Administration operates a Single Frenquency Outlet (SFO) at the communications facility. The southernmost tropospheric antenna (Antenna No. 1) at the facility houses the SFO equipment. During the 5099th CEOS's clean up activities, batteries were observed dumped throughout the inside of the antenna. Some batteries were leaking in boxes. These batteries have since been removed.

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III. ENVIRONMENTAL SETTING

A. Meteorology

Because meteorologic data for Granite Mountain RRS is unavailable, Candle, Alaska, which is located approximately 42 miles north-northwest of the RRS, is used as a reference point.

The climate at Candle, Alaska is characterized by extreme variations in temperature and by low precipitation. Temperature extremes range from 84°F in summer to 56°F below zero in winter. Annual precipitation averages 8.61 inches with over half of the total annual rainfall occurring in June, July, August, and September (Leslie, 1986). Maximum rainfall intensity at Granite Mountain, based on a 10-year, 24-hour rainfall is 2.0 inches (Miller, 1963). Over 95 percent of the annual snow fall occurs from October through April (Leslie, 1986). Net precipitation is calculated by substracting mean annual lake evaporation from annual precipitation (47 FR 31224). Since mean annual lake evaporation is not available for this part of Alaska, the annual potential evapotranspiration was used (NOAA, personal communication, 1988). The potential evapotranspiration for Candle is 14.61 inches per year (Patric and Black, 1968), therefore, the net precipitation is negative 6 inches per year.

B. Geology and Soils

Granite Mountain RRS is located within the Seward Peninsula Physiographic Province. This region is characterized by highlands with rolling topography and gentle slopes.

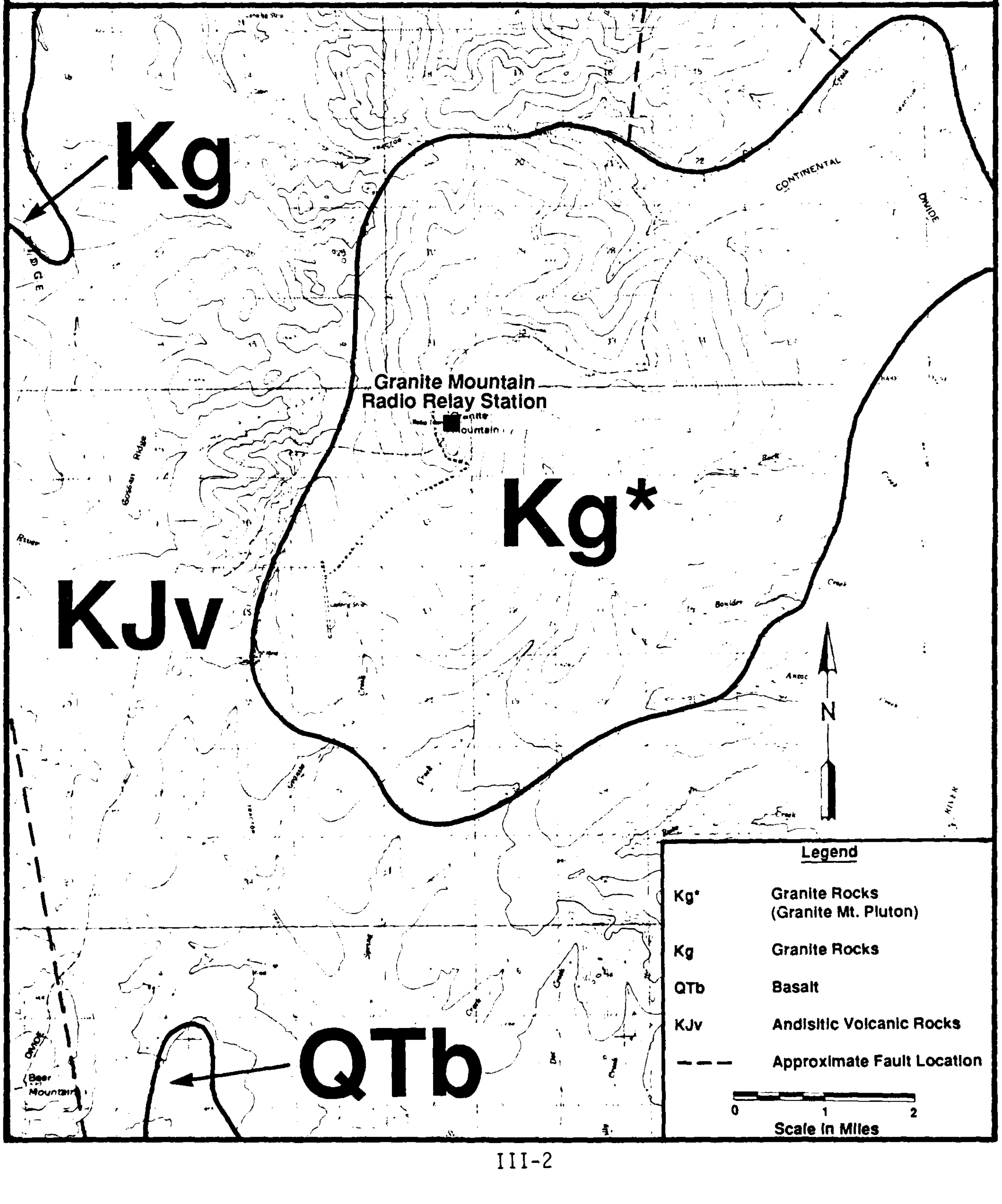
The communications facility and runway area are situated on the Granite Mountain Pluton. The pluton is composed of biotite quartz monzonite rock of mid-Cretaceaus age (Figure 5). Outcrops of this unit are a predominant surface feature around the peak of Granite Mountain. This pluton is surrounded by an

HMTC

Source: U.S.G.S. Misc.
Field Investigation
Map I-492.

Figure 5.

Geology of Granite Mountain Radio Relay Station, Alaska and Vicinity.



andesitic volcanic unit of early Cretaceous age. This unit is predominantly composed of andesitic trachyandesitic crystal and lithic tuffs, tuffaceous volcanic graywacke, massive andesitic breccia, agglomerate, conglomerate, and intercalated flows of porphyritic pyroxene andesite and basalt. A similar unit is located approximately 4 miles northwest of the mountain. Within the vicinity of Granite Mountain Pluton, these rocks are characteristically hornfelsic and propylitically altered to a hard, pale green aggregate of chlorite, epidote, calcite, and sodic plagioclase. Many small unmapped intrusive bodies of hybrid diorite, syenite, and monzonite occur within this unit in the vicinity of granitic plutons, such as Granite Mountain. Some minor faulting has occurred in this unit approximatley 6 miles southwest and 4 miles northeast of Granite Mountain. Approximately 7 miles southwest of the mountain is an early to middle Cretaceous unit of gray to dark red vesicular olivine basalt flows.

According to the U.S. Soil Conservation Service, Granite Mountain RRS lies within the Pergelic Cryaquepts-Pergelic Cryorthents, very gravelly, hilly to steep soil association. This soil association is found on the Seward Peninsula near sea level to about 2,800 feet. The area consists of high ridges separated by narrow valleys and includes numerous mountain peaks. The soils were formed in colluvial material derived from local rock or at lower elevations, glacial till. Vegetation on the ridge tops, rounded hills, and steep south-facing slopes consists of low shrubs, dryas, grasses, and lichens, which support wildlife including caribou, small mammals, and birds.

This association consists of poorly drained to well drained soils with permafrost. Poorly drained soils are found on long uniform slopes, foot slopes, valley bottoms and steep north-facing slopes. The well drained soils occur on high ridges and steep south-facing slopes. Common frost features are solifluction lobes, frost boils, and stone stripes. Soils of this association are usually too wet or steep for most construction, forestry, and farming purposes.

This association consists of six principle components (95 percent) and four other components (5 percent). The following are principal components.

Pergelic Cryaquepts, very gravelly, hilly to steep (35 percent), are poorly drained soils on broad sloping ridges and long steep mountainsides and hillsides. They were mainly formed in gravelly and stony colluvial material but at some lower elevations in very gravelly glacial deposits. The soils consist of a few inches of organic matter and a thin layer of dark gray silt loam over mottled dark gray very gravelly silt loam. Permafrost is usually encountered at a depth of 16 inches. Bedrock is usually deep but has been encountered at depths shallower than 40 inches. Solifluction lobes and frost scars are common (U.S. Department of Agriculture, 1979).

Pergelic Cryaquepts, very gravelly, hilly to steep (20 percent) are well drained soils on steep slopes of ridges, hills, and mountains. They were formed in very gravelly colluvium under a cover that includes low shrubs, grass, dryas, and lichens. Typically, under a very thin mat of coarse organic material there is a think dark brown gravelly silt loam layer over dark yellowish brown and olive brown very gravelly silt loam. It is underlain by shattered bedrock at a depth of about 14 inches.

Histic Pergelic Cryaquepts, very gravelly, hilly to steep (15 percent) are well drained soils on ridges, hills, and mountains under vegetation dominated by low shrubs. In many places they are in close association with Pergelic Cryorthents and differ from those soils only in that they have fairly thick dark brown upper horizons.

Histic Pergelic Cryaquepts, very gravelly, hilly to steep (15 percent) are poorly drained soils on north-facing hillsides and mountainsides, on foot slopes, and in drainageways. Most of these soils were formed in very gravelly colluvium, but in some valleys they consist of glacial till with a silty mantle. The vegetation includes low shrubs, sedges, mosses, and lichens. Usually, the soils have a thin layer of black mucky silt loam over mottled gray very gravelly silt loam located under a thick mat of organic material. Permafrost is about 10 inches below the mineral surface. A few soils with gentle or moderate slopes are included.

Pergelic Ruptic-Histic Cryaquepts, very gravelly, hilly to steep (5 percent) are poorly drained soils on rounded ridges and long side slopes. They were formed in very gravelly and stony residual and colluvial material. Polygons, solifluction lobes, and other patterned surface features are common. In troughs between polygons and in other low positions in the microrelief, there lies a thick mat of organic matter over mottled gravelly silt loam. In centers of polygons and other high points, the organic mat is thin or absent. Permafrost is shallow under the thick mat and is moderately deep under the frost scars. The soil material is frost-churned and contains streaks and patches of organic matter and mineral material of varying texture.

Rough mountain land (5 percent) occupies barren peaks, ridges, and talus slopes, commonly at higher elevations. It supports only scattered vegetation. This is the predominant soil type at the RRS.

The other components (5 percent) consist of Pergelic Cryoborolls, very gravelly, hilly to steep; Typic Cryaquepts, very gravelly, hilly to steep; Lithic Ruptic-Entic Cryoborolls, very gravelly, hilly to steep; and Lithic Ruptic-Entic Cryumbrepts, very gravelly, hilly to steep.

According to the U.S. Soil Conservation Service, permeability in this soil association will vary depending on the specific location until permafrost is encountered. Once permafrost is encountered, the soil is impermeable.

C. Hydrology

Surface Water

The headwaters of many creeks originate around the vicinity of Granite Mountain. The source of many of these creeks is spring water. As shown in Figure 4, Granite Mountain RRS is situated on the Continental Divide and is therefore beyond any flood plains.

Generally, surface water runoff from the communication facility drains either to the west or to the east. Surface water runoff in the vicinity of the runway drains to the west and south into Granite Creek and Spring Creek.

Population served by surface waters 3 miles downstream may consist of the seasonal miners along the northern forks of Sweepstakes Creek (13,000 feet to the southwest). This water may serve as a drinking water source. Spring Creek to the east and Kiwalik River to the west are the closest surface waters, both 5,000 feet away.

Groundwater

Specific groundwater data for the Granite Mountain RRS area is not available; however, some general assumptions can be made based on the nature of the soils and geology of the region. Much of the rainfall at the communications facility infiltrates through the thin soil layer and into the joints and fractures of the underlying granitic rock. These joints and fractures will influence the direction of groundwater flow. The extreme topography of the mountain will also affect the direction of flow. Some of the groundwater discharges from the mountain at lower elevations in the form of springs, which can become headwaters to nearby creeks. One such spring occurs approximately 1.5 to 2.0 miles northeast of the runway along the north side of the access road. Groundwater flow within the vicinity of the runway probably mimmics the surface topography, therefore, flows to the southwest and south.

It is unknown if the groundwater aquifer is used by the seasonal miners. If it is, then approximately 11 people are served by groundwater supplies within 3.8 miles from the RRS.

D. Critical Habitats/Endangered or Threatened Species

According to the Fish and Wildlife Service, Alaska Division, there are no endangered or threatened species of flora or fauna within a 1-mile radius of the

RRS. Additionally, there are no federally- or state-designated critical habitats or wilderness areas within a 1-mile radius of Granite Mountain RRS.

The Granite Mountain area has not been mapped by the National Wetland Inventory, however, the U.S. Fish and Wildlife Service believes that wetlands are present in this area.

IV. FINDINGS

A. Activity Review

A review of installation records and interviews with AAC personnel resulted in the identification of specific operations at Granite Mountain RRS in which HM/HW were handled and generated. These operations included:

- Management of diesel fuel used to power electrical generators;
- Management of electrical equipment possibly containing PCBs;
- Management of lead-acid and nickel-cadmium batteries used to store electricity;
- Management of aviation fuels;
- Vehicle maintenance, including management of motor gasoline, oils, and antifreeze;
- General maintenance of the facility; and
- Use of asbestos as a construction material.

B. Disposal/Spill Site Identification, Evaluation, and Hazard Assessment

Interviews with Air Force personnel and subsequent site inspections resulted in the identification of no potentially contaminated sites at the Granite Mountain RRS. Although no sites were identified or assigned a HAS according to HARM, the methodology and guidelines are included as Appendix C. The objective of this assessment is to identify and provide a relative rating of sites suspected of contamination from hazardous substances. The final rating score would reflect specific components of the hazard posed by a specific site: possible receptors of the contamination (e.g., population within a specified distance of the site and/or critical environments within a one-mile radius of the site); the waste and its characteristics; and the potential pathways for contaminant migration (e.g., surface water, groundwater, flooding).

C. Other Pertinent Information

At the time of the site visit to Granite Mountain RRS on 18 July 1988, the following observations were made:

- Approximately 25 55-gallon drums were stored east of the Temporary Auto Storage Building. These drums appeared to be intact and no spillage was observed (see Photos 1, 2, and 3, Appendix E);

- One 55-gallon storage tank labeled "Lube Oil" was observed between the Temporary Auto Storage Building and an adjacent storage building east of the Temporary Auto Storage Building (see Photo 4, Appendix E);

- The interiors of both the Temporary Auto Storage Building and the adjacent storage building appeared clean. Several 55-gallon drums were observed inside the storage building, however, they did not appear to be leaking (see Photo 5, Appendix E);

- The Temporary Air Terminal was inaccessible and, therefore, it could not be inspected;

- An abandoned bulldozer was observed southeast of the Temporary Auto Storage Building (see Photo 1, Appendix E);

- A fuel bladder, filled with aviation gasoline, was observed at the west edge of the runway and east of the Temporary Air Terminal. During the site visit, a small, single-engine aircraft was observed transporting this fuel to a mining operation several miles away. Minor staining of the soil immediately around the bladder was observed (see Photo 6, Appendix E);

- A fuel oil tank, located east of the runway, appeared to be empty (see Photo 7, Appendix E);

- Eleven 55-gallon drums and a fuel storage tank were observed east of the runway. These items may contain aviation gasoline. No spillage was observed on the ground (see Photo 8, Appendix E);

- The former drum disposal site east of the runway appeared clean and regraded (see Photo 9, Appendix E);

- The solid waste landfill (see Figure 3) south of the communications facility along the east side of the access road was used while the RRS was operational. The disposal area contained small pieces of miscellaneous scrap material and portions of the area appeared to have been regraded. Several stained areas were observed at this site (see Photos 10 and 11, Appendix E);

- An area along the west side of the access road and across from the disposal site, southeast of the communications facility, was reported to have been used to dispose of nonhazardous materials during the 1985 cleanup activities of the 5099th CEOS. The area appeared to have been regraded and clean;

- The former disposal area west of the communications facility appeared to have been regraded and was clean (see Photo 12, Appendix E);

- The former disposal site located north of the communications facility appeared clean and regraded (see Photo 13, Appendix E);

- The Dormitory and Equipment Building were accessible from an entrance on the southeast side of the Equipment Building. Upon entering the building, a small white pile of what appeared to be asbestos was observed on the floor at the base of a vertical pipe. The site visit team did not proceed beyond this point;

- Several small (less than 4 square feet) and slightly discolored areas were observed throughout the site and analyzed for organic vapors using a photoionization detector (PID). The results of these analyses were negative with the exception of one stained area located on the north side of the northeast corner of the easternmost antenna at the facility. This area was less than 2 square feet and difficulty was experienced in maintaining a PID reading of greater than 6 parts per million; and

- A battery was observed within the southernmost antenna. The battery appeared to be intact and providing power to the SFO equipment maintained by the Federal Aviation Administration.

V. CONCLUSIONS

Based on information obtained through interviews with Air Force personnel and review of installation records, small quantities of HM/HW were handled and disposed of at Granite Mountain RRS while the facility was operational, including materials used for maintenance, batteries, and electrical equipment possibly containing PCBs. The liquid wastes and small quantities of hazardous materials have since been removed from the RRS. At the time of the site visit, there was no visible evidence of contamination significant to threaten human health or the environment. The solid waste landfill that was used while the RRS was operational may contain HM/HW, as it was a common practice at similar facilities to bury drums and liquid wastes. The only other health and safety concern at the Granite Mountain RRS is asbestos that may remain within the buildings.

VI. RECOMMENDATIONS

At the time of the site visit, no visible signs of significant contamination were evident at Granite Mountain RRS. However, it is recommended that further IRP investigation be performed at the solid waste landfill to determine if its contents are hazardous. If the waste proves to be hazardous, it should be removed along with any contaminated soil and disposed of according to state and Federal regulations. In addition, all 55-gallon drums remaining around the runway facilities should be removed and temporary fuel storage equipment and fueling operations should be managed to ensure that fuel spills do not occur. The Air Force should also proceed with abatement of any asbestos remaining within the buildings.

GLOSSARY OF TERMS

AGGLOMERATE - Chaotic assemblage of coarse angular pyroclastic materials; volcanic breccia.

AGGREGATE - A mass or body of rock particles, mineral grains, or a mixture of both.

ANDESITE - A dark-colored, fine-grained extrusive (volcanic) rock composed primarily of the minerals feldspar, biotite, hornblende, and pyroxene.

ANNUAL PRECIPITATION - The total amount of rainfall and snowfall for the year.

BASALT - A general term for dark-colored mafic igneous rocks, commonly extrusive but locally intrusive (e.g. as dikes), composed chiefly of calcic plagioclase and clinopyroxene; the fine-grained equivalent of *gabbro*.

BEDROCK - A general term for the rock, usually solid, that underlies soil or other unconsolidated, superficial material.

BIOTITE - A widely distributed and important rock-forming mineral of the mica group, usually black, dark brown, or dark green.

BORIC ACID - A white, crystalline compound: H_3BO_3. Obtained by treating native borax with sulfuric acid; used as an antiseptic and a preservative.

BRECCIA - A coarse-grained clastic rock, composed of angular broken rock fragments held together by a mineral cement or in a fine-grained matrix.

CALCITE - A common rock-forming mineral: $CaCO_3$. It is the principal constituent of limestone.

CHLORITE - A group of platy, monoclinic, usually greenish minerals of the general formula: $(Mg,Fe^{+2},Fe^{+3})_6AlSi_3O_{10}(OH)_8$. It is characterized by prominent ferrous iron and by the absence of calcium and alkalies; chromium and manganese may be present.

CLAY LOAM - A soil containing 27 to 40 percent clay, 20 to 45 percent sand and the remainder silt.

COLLUVIAL - Deposited by surface runoff, usually at the base of a slope; generally any loose, heterogeneous mass of soil material deposited at the base of a slope.

CONGLOMERATE - A coarse-grained sedimentary rock, composed of rounded pebbles, cobbles, and boulders, set in a fine-grained matrix of sand or silt, and commonly cemented by calcium carbonate, iron oxide, silica, or hardened clay.

CONTAMINANT - As defined by Section 101(f)(33) of Superfund Amendments and Reauthorization Act of 1986 (SARA) shall include, but not be limited to any element, substance, compound, or mixture, including disease-causing agents, which

after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring; except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under:

(a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,

(b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

(c) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress),

(d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,

(e) any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

(f) any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act;

and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

CREEK - A term generally applied to any natural stream of water, normally larger than a brook but smaller than a river.

CREOSOTE - An oily liquid consisting principally of cresol and other phenols, obtained by the destructive distillation of wood or coal tar; used as a preservative.

CRESOL - Any one of three isomeric liquid or crystalline compounds: C_7H_8O. Obtained by the distillation of coal tar or wood tar.

CRETACEOUS - The final period of the Mesozoic era, thought to have covered the span of time between 135 and 65 million years ago.

CRITICAL HABITAT - The specific areas within the geographical area occupied by the species on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management consideration or protection.

CRITICAL HABITAT [Fed] - The specific areas within the geographical area occupied the species, at the time it is listed in accordance with the provisions of section 4 of the Endangered Species Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management consideration or protection; and specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the Endangered Species Act, upon a determination by the Secretary that such areas are essential for the conservation of the species.

CRITICAL HABITAT [Alaska] - Places where protective emphasis is on the environment in which wildlife occurs. Critical habitats may be complete biotic systems -- identifiable environmental units that operate as self-sustaining systems -- or well-defined areas specifically needed by wildlife for certain functions such as nesting or spawning.

CRYSTAL - A homogeneous, solid body of a chemical element, compound, or isomorphous mixture, having a regularly repeating atomic arrangment that may be outwardly expressed by plane faces.

CRYSTALLINE - Pertaining to or having the nature of a crystal, or formed by crystallization; specifically having a crystal structure or a regular arrangement of atoms in a space lattice.

DEPOSITS - Earth material of any type, either consolidated or unconsolidated, that has accumulated by some natural process or agent.

DIORITE - A group of igneous rocks composed of dark-colored amphibole (esp. hornblende) oligoclase, andesine, pyroxene, and small amounts of quartz; the intrusive equivalent of andesite.

DISCHARGE - The release of any waste stream or any constituent thereof to the environment which is not covered.

DRAINAGE CLASS [natural] - Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained - Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained - Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained - Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of

mottling.
Moderately well drained - Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained - Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained - Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough periods during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained - Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

ELEVATION - The vertical distance from a datum (usually mean sea level) to a point or object on the Earth's surface; esp. the height of a ground point above sea level.

ENDANGERED SPECIES - Any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of the Endangered Species Act would present an overwhelming and overriding risk to man.

EPIDOTE - A yellowish-green, pistachio-green, or blackish-green mineral: $Ca_2(Al, Fe)_3 Si_3O_{12}(OH)$. It commonly occurs associated with albite and chlorite, as formless grains, masses, or monoclinic srystals in low-grade metamorphic rocks derived from limestones, or in igneous rocks.

EROSION - The general process or the group of processes whereby the materials of the Earth's crust are loosened, dissolved, or worn away, and simultaneously moved from one place to another by natural agencies, but usually exclude mass wasting.

FAULT - A fracture or a zone of fractures along which there has been displacement of the sides relative to one another parallel to the fracture.

FLOW - Any rock deformation that is not instantly recoverable without permanent loss of cohesion. Various types of flow in which the mechanism is known include

cataclastic flow, *gliding flow*, and *recrystallization flow*.

GLACIAL TILL - See TILL.

GRANITE - Broadly applied, any crystalline, quartz-bearing plutonic rock; also commonly contains feldspar, mica, hornblende, or pyroxene.

GRANITIC - Composed of granite.

GRAVEL - An unconsolidated, natural accumulation of rounded rock fragments resulting from erosion, consisting predominantly of particles larger than sand, such as boulders, cobbles, pebbles, granules or any combination of these fragments.

GRAYWACKE - An old rock name that has been variously defined but is now generally applied to a dark gray firmly indurated coarse-grained sandstone that consists of poorly sorted angular to subangular grains of quartz and feldspar, with a variety of dark rock and mineral fragments embedded in a compact clayey matrix having the general composition of slate and containing an abundance of very fine-grained illite, sericite, and chloritic minerals.

GROUNDWATER - Refers to the subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated.

HARM - Hazard Assessment Rating Methodology - A system adopted and used by the United States Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December 1981.)

HAS - Hazard Assessment Score - The score developed by using the Hazardous Assessment Rating Methodology (HARM).

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

a. cause, or significantly contribute to, an increase in mortality or an increase in serious or incapacitating reversible illness, or

b. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

HORNFELS - a fine-grained rock composed of a mosaic of equidimensional grains without preferred orientation and typically formed by contact metamorphism. Porphyroblasts or relict phenocrysts may be present in the characteristically granoblastic (or decussate) matrix.

HYDROCHLORIC ACID - An aqueous solution of hydrogen chloride, widely used in industry, and medicine; also called muriatic acid.

HYDROGEN PEROXIDE - An unstable, colorless, syrupy liquid: H_2O_2. Used in aqueous solutions as antiseptics and bleaching agents.

IGNEOUS ROCKS - Rock or mineral that has solidified from molten or partially molten material, i.e. from a magma.

INTERCALATED - Said of layered material that exists or is introduced between layers of a different character, especially thin strata of one material that alternate with thicker strata of some other kind.

INTRUSIVE - Magma emplaced into a pre-existing rock; the igneous rock mass so formed within the surrounding rock.

LITHIC - Said of a medium-grained sedimentary rock, and of a pyroclastic deposit, containing abundant fragments of previously formed rocks.

LOAM - A rich, permeable soil composed of a friable mixture of relatively equal proportions of sand, silt, and clay particles, and usually containing organic matter.

MIGRATION (Contaminant) - The movement of contaminants through pathways (groundwater, surface water, soil, and air).

MONZONITE - A group of plutonic rocks, intermediate in composition between syenite and diorite, containing approximately equal amounts of alkali feldspar and plagioclase, little or no quartz, and augite.

NATURAL AREA - An area of land or water that has retained its wilderness character, although not necessarily completely natural and undisturbed, or that has rare or vanishing flora, fauna, archaeological, scenic, historical, or similar features of scientific or educational value.

NEOPRENE - Any of various types of synthetic rubber obtained by polymerizing chloroprene.

OUTCROP - That part of a geologic formation or structure that appears at the surface of the Earth; also, bedrock that is covered only by surficial deposits such as alluvium.

PARK - An area of public land known for its natural scenery and preserved for public recreation by a State or national government.

PEAK - (a) The more or less conical or pointed top of a hill or mountain; one of the crests of a mountain; a prominent summit or the highest point. (b) An individual mountain or hill taken as a whole, especially when isolated or having a pointed, conspicuous summit.

PERMAFROST - Any soil, subsoil, or other surficial deposit, or even bedrock, occurring in arctic, subarctic, and alpine regions at a variable depth beneath the Earth's surface in which a temperature below freezing has existed continuously for a long time (from two years to tens of thousands of years).
PLAGIOCLASE - A group of triclinic feldspars of the general formula: (Na, Ca) Al (Si, Al) Si_2O_8. Plagioclase minerals are among the commonest rock-forming minerals.

PLUTON - An igneous intrusion.

PORPHYRITIC - Said of the texture of an igneous rock in which larger crystals are set in a finer-grained groundmass.

POTASSIUM HYDROXIDE - A whitish deliquescent solid: KOH. Yields a caustic solution used in salt-making, electroplating, and as a chemical reagent.

PRESERVE - An area maintained and protected especially for regulated hunting and fishing.

PRISTINE - Something that is still pure or untouched; uncorrupted; unspoiled.

PROPYLITICAL - Pertaining to or resembling propylite, a hydrothermally altered andestic.

PYROXENE - A group of dark rock-forming minerals, closely related in crystal form and composition.

QUARTZ - A crystalline silica, an important rock forming mineral: SiO_2. Occurs either in transparent hexagonal crystals (colorless or colored by impurities or in crystalline. Forms the major proportion of most sands and has a widespread distribution in igneous, metamorphic and sedimentary rocks.

RECHARGE AREA - An area in which water is absorbed that eventually reaches the zone of saturation in one or more aquifers.

ROCK - An aggregate of one or more minerals; or a body of undifferentiated mineral matter or of solid organic material.

RUBBLE - A loose mass of angular rock fragments, commonly overlying outcropping rock; the unconsolidated equivalent of a *breccia*.

SAND - A rock or mineral particle in the soil, having a diameter in the range 0.52 - 2 mm.

SANDY LOAM - A soil containing 43 - 85% sand, 0 - 50% silt, and 0 - 20% clay, or containing at least 52% sand and no more than 20% clay and having the percentage of silt plus twice the percentage of clay exceeding 30, or containing 43 - 52% sand, less than 50% silt, and less than 7% clay.

SILT LOAM - A soil containing 50 to 88 percent silt, 0 to 27 percent clay and 0 to 50 percent sand.

SOIL PERMEABILITY - The characteristic of the soil that enables water to move downward through the profile. Permeability is measured as to the number of inches per hour that water moves downward through the saturated soil.

Terms describing permeability are:

Very Slow	- less than 0.06 inches per hour (less than 4.24×10^{-5} cm/sec)
Slow	- 0.06 to 0.20 inches per hour (4.24×10^{-5} to 1.41×10^{-4} cm/sec)
Moderately Slow	- 0.20 to 0.63 inches per hour (1.41×10^{-4} to 4.45×10^{-4} cm/sec)
Moderate	- 0.63 to 2.00 inches per hour (4.45×10^{-4} to 1.41×10^{-3} cm/sec)
Moderately Rapid	- 2.00 to 6.00 inches per hour (1.41×10^{-3} to 4.24×10^{-3} cm/sec)
Rapid	- 6.00 to 20.00 inches per hour (4.24×10^{-3} to 1.41×10^{-2} cm/sec)
Very Rapid	- more than 20.00 inches per hour (more than 1.41×10^{-2} cm/sec)

(Reference: U.S.D.A. Soil Conservation Service)

SOLIFLUCTION LOBE - An isolated, tongue-shaped feature, up to 25 m wide and 150 m long, formed by more rapid solifluction on certain sections of a slope showing variations in gradient. It commonly has a steep front (15°-25°) and a relatively smooth upper surface.

SPRING - A place where groundwater flows naturally from a rock or the soil onto the land surface or into a body of water.

SULFURIC ACID - A colorless, exceedingly corrosive, oily liquid: H_2SO_4. Extensively employed in the manufacture of soda, batteries, and a great variety of industrial operations.

SYENITE - A group of plutonic rocks containing alkali feldspar (usually orthoclase, microcline, or perthite), a small amount of plagioclase, and one or more mafic minerals.

THREATENED SPECIES - Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

TILL - Dominantly unsorted and unstratified drift, generally unconsolidated, deposited directly by and underneath a glacier without subsequent reworking by meltwater, and consisting of a heterogenous mixture of clay, silt, sand and gravel and boulders ranging widely in size and shape

TOPOGRAPHY - The general conformation of a land surface, including its relief and the position of its natural and manmade features.

TRACHYANDESITIC - an extrusive rock, intermediate in composition between trachyte and andesite.

TUFF - A general term for all consolidated pyroclastic rocks.

TUFFACEOUS - Said of a rock contianing up to 50% tuff.

VOLCANIC - Igneous rocks that have reached the earth's surface before solidifying; generally finely crystalline or glassy.

WETLANDS [EPA] - Marshes, swamps, bogs, and other low-lying areas, which during some period of the year will be covered in part by natural nonflood waters.

WETLANDS - Are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of the Classification of Wetlands and Deepwater Habitats of the United States, wetlands must have one or more of the following three attributes: (1) at least periodically , the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

WILDERNESS AREA - An area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this chapter of the Wilderness Act, an area of underdeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or an primitive and unconfined type of recreation; (3) has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic or historical value.

WISCONSINIAN - Pertaining to the classical fourth glacial stage of Pleistocene epoch in North America.

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APPENDIX A

RESUMES OF PRELIMINARY ASSESSMENT TEAM MEMBERS

RAYMOND G. CLARK, JR.

EDUCATION

Completed graduate engineering courses, George Washington University, 1957
B.S., Mechanical Engineering, University of Maryland, 1949

SPECIALIZED TRAINING

Grad. European Command Military Assistance School, Stuttgart, 1969
Grad. Army Psychological Warfare School, Fort Bragg, 1963
Grad. Sanz School of Languages, D.C., 1963
Grad. DOD Military Assistance Institute, Arlington, 1963
Grad. Defense Procurement Management Course, Fort Lee, 1960
Grad. Engineer Officer's Advanced Course, Fort Belvoir, 1958

CERTIFICATIONS

Registered Professional Engineer: Kentucky (#4341); Virginia (#8303); Florida (#36228)

EXPERIENCE

Thirty-one years of experience in engineering design, planning and management including construction and construction management, environmental, operations and maintenance, repair and utilities, research and development, electrical, mechanical, master planning and city management. Over six years' logistical experience including planning and programming of military assistance materiel and training for foreign countries, serving as liaison with American private industry, and directing materiel storage activities in an overseas area. Over two years' experience as an engineering instructor. Extensive experience in personnel management, cost reduction programs, and systems improvement.

EMPLOYMENT

Dynamac Corporation (1986-present): Program Manager/Department Manager

Responsible for activities relating to Preliminary Analysis, Site Investigations, Remedial Investigations, Feasibility Studies, and Remedial Action for the Installation Restoration Program for the U.S. Air Force, Air National Guard, Bureau of Prisons, and the U.S. Coast Guard, including records search, review and evaluation of previous studies; preparation of statements of work, feasibility studies; preparation of remedial action plans, designs and specifications; review of said studies/plans to ensure that they are in conformance with requirements; review of environmental studies and reports; preparation of Air Force Installation Restoration Program Management Guidance; and preparation of Part B permits.

Howard Needles Tammen & Bergendoff (HNTB) (1981-1986): Manager

Responsible, as Project Manager, for: design of a new concourse complex at Miami International Airport to include terminal building, roadway system, aircraft apron, drainage channel relocation, satellite building with underground pedestrian tunnel, and associated underground utility corridors, to include subsurface aircraft fueling systems, with an estimated construction cost of $163 million; a cargo vehicle tunnel under the crosswind runway with an estimated construction cost of $15 million; design and construction of two large corporate jet aircraft hangars; and for the hydrocarbon recovery program to include investigation, analysis, design of recovery systems, monitoring of recovery systems, and planning and design of residual recovery systems utilizing biodegradation. Participated, as sub-consultant, in Air Force IRP seminar.

HNTB (1979-1981): Airport Engineer

Responsibilities included development of master plan for Iowa Air National Guard base; project initiation assistance for a new regional airport in Florida; engineering assistance for new facilities design and construction for Maryland Air National Guard; master plan for city maintenance facilities, Orlando, Florida; in-country master plan and preliminary engineering project management for Madrid, Spain, International Airport; and project management of master plan for Whiting Naval Air Station and outlying fields in Florida.

HNTB (1974-1979): Design Engineer

Responsibilities included development of feasibility and site selection studies for reliever airports in Cleveland and Atlanta; site selection and facilities requirements for the Office of Aeronautical Charting and Cartography, NOAA; and onsite mechanical and electrical engineering design for terminal improvements at Baltimore-Washington International Airport, Maryland.

HNTB (1972-1974): Airport Engineer

Responsible for development of portions of the master plan and preliminary engineering for a new international airport for Lisbon, Portugal, estimated to cost $250 million.

Self-employed (1971-1972): Private Consultant

Responsible for engineering planning and installation of a production line for multimillion-dollar contract in Madrid, Spain, to fabricate transmissions and differentials for U.S. Army vehicles.

U.S. Army, Corps of Engineers (1969-1971): Chief, Materiel & Programs

Directed materiel planning and military training programs of military assistance to the Spanish Army. Controlled arrival and acceptance of materiel by host government. Served as liaison/advisor to American industry interested

in conducting business with Spanish government. Was Engineer Advisor to Spanish Army Construction, Armament and Combat Engineers, also the Engineer Academy and Engineer School of Application.

Corps of Engineers (1968-1969): Chief, R&D Branch, OCE

Directed office responsible to Chief of Engineers for research and development. Developed research studies in new concepts of bridging, new explosives, family of construction equipment, night vision equipment, expedient airfield surfacing, expedient aircraft fueling systems, water purification equipment and policies, prefabricated buildings, etc. Achieved Department of Army acceptance for development and testing of new floating bridge. Participated in high-level Department Committee charged with development of a Tactical Gap Crossing Capability Model.

Corps of Engineers (1967-1968): Division Engineer

Facilities engineer in Korea. Was fully responsible for management and maintenance of 96 compounds within 245 square miles including 6,000+ buildings, 1 million linear feet of electrical distribution lines, 18 water purification and distribution systems, sanitary sewage disposal systems, roads, bridges, and fire protection facilities with real property value of more than $256 million. Planned and developed the first five-year master plan for this area. Administered $12 million budget and $2 million engineer supply operation. Was in responsible charge of over 500 persons. Developed and obtained approval for additional projects worth $9 million for essential maintenance and repair. Directed cost reduction programs that produced more than $500,000 savings to the United States in the first year.

Corps of Engineers (1963-1967): Engineer Advisor

Engineer and aviation advisor to the Spanish Army. Developed major modernization program for Spanish Army Engineers, including programming of modern engineer and mobile maintenance equipment. Directed U.S. portion of construction, testing and acceptance of six powder plants, one shell loading facility, an Engineer School of Application, and depot rebuild facilities for engineer, artillery, and armor equipment. Planned and developed organization of a helicopter battalion for the Spanish Army. Responsible for sales, delivery, assembly and testing of 12 new helicopters in country. Provided U.S. assistance to unit until self-sufficiency was achieved. Was U.S. advisor to Engineer Academy, School of Application and Polytechnic Institute.

Corps of Engineers (1960-1963): Deputy District Engineer

Responsible for planning and development of extensive construction projects in the Ohio River Basin for flood control and canalization, including dam, lock, bridge, and building construction, highway relocation, watershed studies, real estate acquisitions and dispositions. Was contracting officer for more than $75

million of projects per year. Supervised approximately 1,300 personnel, including 300 engineers. Planned and directed cost reduction programs amounting to more than $200,000 per year. Programmed and controlled development of a modern radio and control net in a four-state area.

Corps of Engineers (1959-1960): Area Engineer

Directed construction of a large airfield in Ohio as Contracting Officer's representative. Assured that all construction (runway, steam power plant, fuel transfer and loading facilities, utilities, buildings, etc.) complied with terms of plans and specifications. Was onsite liaison between Air Force and contractors.

Corps of Engineers (1958-1959): Chief, Supply Branch

Managed engineer supply yard containing over $21 million construction supplies and engineer equipment. Directed in-storage maintenance, processing and deprocessing of equipment. Achieved complete survey of items on hand, a new locator system and complete rewarehousing, resulting in approximately $159,000 savings in the first year.

Corps of Engineers (1957-1958): Student

U.S. Army Engineer School, Engineer Officer's Advanced Course.

Corps of Engineers (1954-1957): Engineer Manager

Managed engineer construction projects and was assigned to staff and faculty of the Engineer School. Was in charge of instruction on engineer equipment utilization, management and maintenance. Directed Electronic Section of the school. Coordinated preparation of five-year master plan for the Department of Mechanical and Technical Equipment.

Corps of Engineers (1949-1954): Engineer Commander

Positions of minor but increasing importance and responsibility in engineering management, communications, demolitions, construction administration and logistics.

PROFESSIONAL AFFILIATIONS

Member, National Society of Professional Engineers
Fellow, Society of American Military Engineers
Member, American Society of Civil Engineers
Member, Virginia Engineering Society
Member, Project Management Institute

HARDWARE

IBM PC

SOFTWARE

Lotus 1-2-3, D Base III Plus, Framework, Project Scheduler 5000, Harvard Project Manager, Volkswriter, Microsoft Project

BETSY A. BRIGGS

EDUCATION

B.S., Biology and Chemistry, State University College of New York at Cortland, 1979

Completed several courses in M.B.A. program, University of Phoenix, Denver, Colorado Division, 1984

SPECIALIZED TRAINING

Hazardous Waste Management course, Air Force Institute of Technology, 1986

CERTIFICATION

Certified Hazardous Materials Manager, Institute of Hazardous Materials Management, 1985

SECURITY CLEARANCE

Secret/DOE

EXPERIENCE

Nine years of experience including three years in hazardous waste management, two years as an environmental engineer, two years as an ecologist, and two years in laboratory research. Has conducted ambient air quality monitoring programs, critical pathways projects to study movement of radioactive materials in the environment, metallurgic laboratory analyses, and independent studies in biology and chemistry. Currently provides managerial oversight and technical support to a hazardous waste program for the Air Force.

EMPLOYMENT

Dynamac Corporation (1985-present): Program Manager/Hazardous Waste Specialist

Primary responsibility as program manager is to oversee and manage up to 44 field personnel involved in RCRA and CERCLA work in support of the U.S. Air Force. Other duties include performing preliminary assessments/site surveys for the Air National Guard, marketing and proposal preparation, and preparing and providing training in preparation for the Certified Hazardous Materials Manager examination.

As hazardous waste specialist the primary responsibility was to manage the hazardous waste program at Myrtle Beach Air Force Base. Duties included:

- o Reviewing the design and specifications of various base construction projects and overseeing such projects to ensure compliance with all applicable state and federal hazardous waste regulations. Projects under design included a corrosion control facility, TSD facility, two accumulation points, and a parts cleaning vat system. Construction project oversight included the final inspection of the entomology building to ensure that the facility was equipped for proper storage, usage and disposal of pesticides; removal of materials contaminated with pesticides, PCBs, petroleum products, and solvents from six sites; asbestos removal and disposal from a former hangar site; and the removal of two underground storage tanks, one of which was leaking.
- o Conducting surveys of hazardous waste generating activities.
- o Advising on need for and methods of minimizing hazardous waste generation.
- o Writing and maintaining hazardous waste management plan.
- o Preparing hazardous waste management reports and documents required by state and federal law.
- o Maintaining liaison with federal and state regulatory agencies on matters involving criteria, standards, performance specifications, and monitoring.
- o Providing information and technical consultation to Air Force installation staff regarding hazardous materials and hazardous waste operations.
- o Serving as ad hoc advisor to environmental contingency response teams.

<u>Rockwell International (1982-1984)</u>: Environmental Engineer

Primary responsibility was collection, evaluation, and reporting of ambient air monitoring data. Other responsibilities included technical assistance for monitoring total suspended solids in ambient air. Also performed data collection and reduction of air effluent emission control activities.

Environmental monitoring and control programs are to ensure that all Department of Energy and other governmental effluent regulations are met, and that plant effluents are consistent with the As Low As Reasonably Achievable (ALARA) Principle. Monthly and Annual Reports summarize the effluent and environmental monitoring programs.

<u>Rockwell International (1980-1982)</u>: Ecologist

Responsible for planning, organizing, and leading critical pathways projects designed to study the movement of radioactive materials throughout the environment. Projects were: (1) general critical pathway evaluation to identify

sampling points possibly not considered in present monitoring program; (2) plant uptake versus plant uptake plus foliar deposition measurement study; (3) deer tissue analysis program; and (4) food stuff monitoring program. Progress and results were published in semiannual reports.

Colorado School of Mines Research Institute, Texas Gulf Research Laboratory (1979-1980): Senior Laboratory Technician

Work involved quantitative analysis of platinum, palladium, and silver in soil samples. Analysis included sample preparation, fire assays, calorimetric procedures, and smelt tests.

State University College of New York at Cortland (1978-1979): Undergraduate Independent Study

Project involved the isolation of trail pheromone from spun silk of *Hyphantria* (fall webworm). Included organic and inorganic extraction procedures and performing bioassays. Also worked on production of synthetic diet comparable to fresh leaf diet for *Malacosomo* (eastern tent caterpillar).

PUBLICATIONS

Hazardous Waste Management Survey for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1986 and 1988.

Hazardous Waste Management Plan for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1987 and 1988.

Waste Minimization Guidance for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1988.

Underground Storage Tank Management Plan for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1988.

Annual Environmental Monitoring Report, Rockwell International, Energy Systems Group, Rocky Flats Plant, 1982 and 1983.

Environmental Studies Group Semiannual Report, Rockwell International, Energy Systems Group, Rocky Flats Plant, June/December of 1980 and 1981.

TECHNICAL PRESENTATIONS

PCB Management, Myrtle Beach Air Force Base, 1987.

Underground Storage Tank Regulations/History, Myrtle Beach Air Force Base, 1986.

Overview of the Hazardous Waste Training Program, Myrtle Beach Air Force Base, 1985.

Overview of the Environmental Studies Group, Nevada Test Site and Rockwell International at Hanford, Washington, 1981.

NATASHA M. BROCK

EDUCATION

Graduate work, civil/environmental engineering, University of Maryland, 1987-present

Graduate work, civil/environmental engineering, University of Delaware, 1985-1986

B.S. (cum laude), environmental science, University of the District of Columbia, 1984

Undergraduate work, biology, The American University, 1978-1980

CERTIFICATION

Health & Safety Training Level C

EXPERIENCE

Three years' experience in the environmental and hazardous waste field. Work performed includes remedial investigations/feasibility studies, RCRA facility assessments, comprehensive monitoring evaluations, and remedial facility investigations. Helped develop and test biological and chemical processes used in minimization of hazardous and sanitary waste generation. Researched multiple substrate degradation using aerobic and anaerobic organisms.

EMPLOYMENT

Dynamac Corporation (1987-present): Environmental Scientist

In working for Dynamac's Hazardous Materials Technical Center (HMTC), performs Preliminary Assessments, Remedial Investigations and Feasibility Studies (PA/RI/FS) under the Air National Guard Installation Restoration Program. Specifically involved in determining rates and extent of contamination, recommending groundwater monitoring procedures, and soil sampling and analysis procedures. In the process of preparing standard operating procedure manuals for quick remedial response to site spills and releases, and PA/RI/FS.

C.C. Johnson & Malhotra, P.C. (1986-1987): Environmental Scientist

Involved as part of a team in performing Remedial Investigations/Feasibility Studies (RI/FS) for EPA Regions I and IV under Resource Conservation and Recovery Act (RCRA) work assignments for REM II projects. Participated on a team involved in RCRA Facility Assessments (RFAs), Comprehensive Monitoring Evaluations (CMEs), and Remedial Facility Investigations (RFIs) for EPA work assignments under RCRA for REM III projects in Regions I and IV. Work included solo oversight observations of field sampling and facility inspections. Additional responsibilities included promotion work, graphic layout, data entry-quality check for various projects. Certified Health & Safety Training Level C.

Work Force Temporary Services (1985-1986): Research Scientist

In working for DuPont's Engineering Test Center, helped in the development and testing of laboratory-scale biological and chemical processes for a division whose main purpose was to reduce the amount of hazardous waste generated. Also worked for Hercules, Inc., with a group involved in polymer use for wastewater treatment for clients in various industrial fields. Specifically involved in product consultation, troubleshooting, and product development.

National Oceanic and Atmospheric Administration (1982-1984): Research Assistant

Involved with an information gathering and distribution center of weather impacts worldwide. Specifically involved in data collection, distribution of data to clients, assessment production and special reports.

JANET SALYER EMRY

EDUCATION

M.S., geology, Old Dominion University, 1987
B.S. (cum laude), geology, James Madison University, 1983

EXPERIENCE

Three years' technical experience in the fields of hydrogeology and environmental science, including drilling and placement of wells, well monitoring, aquifer testing, determination of hydraulic properties, computer modeling of aquifer systems, and field and laboratory soils analysis.

EMPLOYMENT

Dynamac Corporation (1987-present): Staff Scientist/Hydrogeologist

Responsibilities include Preliminary Assessments, Site Investigations, Remedial Investigations, Feasibility Studies, and Emergency Responses to include providing geological and hydrological assessments of hazardous waste disposal/spill sites, determination of rates and extents of contaminant migration, and computer modeling of groundwater flow and contaminant transport. Projects are for the U.S. Air Force and Air National Guard Installation Restoration Program.

Froehling and Robertson, Inc. (1986-1987): Geologist/Engineering Technician

Performed both field and laboratory engineering soils tests.

The Nature Conservancy (1985-1986): Hydrogeologist

Investigated groundwater geology of the Nature Conservancy's Nags Head Woods Ecological Preserve in Dare County, North Carolina. Study included installing wells, monitoring water table levels, determination of hydraulic parameters through a pumping test, stratigraphic test borings, and computer modeling.

Old Dominion University (1983-1985): Teaching Assistant, Department of Geological Sciences

Taught laboratory classes in Earth Science and Historical Geology.

PROFESSIONAL AFFILIATIONS

Geological Society of America
National Water Well Association/Association of Ground Water Scientists and Engineers

PUBLICATION

Impact of Municipal Pumpage Upon a Barrier Island Water Table, Nags Head and Kill Devil Hills, North Carolina. In: Abstracts with Programs, Geological Society of America, Vol. 19, No. 2, February 1987.

KATHRYN A. GLADDEN

EDUCATION

B.S., chemical engineering (minor in biological sciences), University of Washington, 1978

SECURITY CLEARANCE

Secret DOD clearance

EXPERIENCE

Seven years of experience in hazardous waste consulting and plant process engineering. Experience includes development of engineering alternatives for reduction of in-plant effluents and preparation of RCRA background listing documents for the plastics industry.

EMPLOYMENT

Dynamac Corporation (1985-present): Staff Engineer

Performs studies on the feasibility of solvent recycling, including the evaluation of several alternatives. Studies to date have included 15 sites. For each site, prepared reports describing present practice for solvent use and disposal, and conducted economic analyses of options.

Conducted preliminary site investigations and ranking of hazardous waste sites for the U.S. Federal Bureau of Prisons. Prepared reports detailing site investigation findings and recommendations for Phase II monitoring and sampling.

Preparing statement of work for a Phase IV-A remedial action plan for the Air Force's Installation Restoration Program.

Conducted analysis of public comments on Advanced Notice of Public Rulemaking to establish National Primary Drinking Water Regulations for radionuclide contaminants.

Peer Consultants (1984-1985): Staff Engineer

Developed background documents for listing of RCRA hazardous wastes.

Engineering Science (1983-1984): Staff Engineer

Conducted regulatory policy review and technology assessment of transportation and decontamination procedures for acutely hazardous wastes. Project engineer for development of a cost analysis methodology for the U.S. Army Toxic and Hazardous Materials Agency Installation Restoration Program.

Weyerhaeuser Company (1978-1983): Chemical Engineer

Conducted plant environmental audits to develop in-plant effluent load balances; developed capital alternatives and improved operating procedures for in-plant effluent reduction; developed and implemented recommendations for plant energy conservation and process optimization programs; investigated industrial hygiene impacts of wood pyrolysis air emissions, and performed pilot trials for wood gasification and pyrolysis technology development.

PROFESSIONAL AFFILIATIONS

Tau Beta Pi Engineering Honorary
Society of Women Engineers

MARK D. JOHNSON

EDUCATION

B.S., Geology, James Madison University, 1980

EXPERIENCE

Eight years' technical and management experience including geologic mapping, subsurface investigations, foundation inspections, groundwater monitoring, pumping and observation well installation, geotechnical instrumentation, groundwater assessment, preparation of Air Force Installation Restoration Program Guidance, preparation of statements of work for environmental field monitoring and feasibility studies for the Air Force and the Air National Guard, development of environmental field monitoring programs, and preparation of Preliminary Assessments for the Air National Guard.

EMPLOYMENT

Dynamac Corporation (1984-present): Senior Staff Scientist/Geologist

Primarily responsible for developing and managing technical support programs relevant to CERCLA related activities for the Air Force, Air National Guard, Department of Justice and Coast Guard. These activities include Statements of Work for Site Investigations (SI), Remedial Investigations (RI), and Feasibility Studies (FS); assessing groundwater at hazardous waste disposal/spill sites for the purpose of determining rates and extents of contaminant migration and for developing SI and RI programs and identifying remedial actions; reviewing SI, RI and FS contractor work plans for various government clients, developing technical and contractual requirements for SI, RI and FS projects, managing the development and preparation of Preliminary Assessments, and assisting clients in the development of their environmental management programs, which included preparation of the Air Force's Installation Restoration Program Management Guidance document.

Bechtel Associates Professional Corporation (1981-1984): Geologist

Performed the following duties in conjunction with major civil engineering projects including subways, nuclear power plants and buildings: prepared geologic maps of surface and subsurface facilities in rock and soil including tunnels, foundations and vaults; assessed groundwater conditions in connection with construction activities and groundwater control systems; monitored the installation of permanent and temporary dewatering systems and observation wells; monitored surface and subsurface settlement of tunnels; and participated in subsurface investigations.

Schnabel Engineering Associates (1981): Geologist

Inspected foundations and backfill placement.

PROFESSIONAL CREDENTIALS

Registered Professional Geologist, South Carolina, #116, 1987

PROFESSIONAL AFFILIATIONS

Association of Engineering Geologists
National Water Well Association/Association of Ground Water Scientists and Engineers

NAICHIA YEH

EDUCATION

Ph.D., Environmental Sciences, The University of Texas at Dallas, 1987
M.S., Environmental Sciences, The University of Texas at Dallas, 1984
B.S., Physics, National Taiwan Normal University, 1978

EXPERIENCE

Nine years of combined academic and technical experience in hazardous waste management and in supplying technology-based solutions to environmental problems, including environmental assessment and evaluation of the nature and the potential environmental impacts of hazardous waste. Has extensive knowledge in computer-aided modeling methodology.

EMPLOYMENT

Dynamac Corporation (1987-present): Environmental Scientist

Conducts preliminary assessments of suspected hazardous materials/hazardous waste sites at military installations in order to identify, and evaluate potentially hazardous waste disposal sites. Also, quantifies contamination at these sites and analyzes the data in order to determine both short-term and long-term public health effect as well as future risks that may result from exposure to the site contaminants.

Provides technical information consultation to clients with inquiries regarding state-of-the-art technology, current regulations and hazards associated with usage of hazardous materials. Also provides guidance on proper transportation and disposal methods of hazardous wastes, safe storage and handling for hazardous materials, and hazards associated with chemicals and substances.

Provides computerized management services support for environmental contracts to the Hazardous Material Management Division of the Dynamac Corporation. Conducts scientific data processing and data analysis, and develops databases for managing work assignments and contracts.

Developed an electronic hazardous assessment rating system which is a fully computerized version of the U.S. Air Force Hazardous Assessment Rating System. Designed a technical inquiry data base system to keep track of the technical inquiry service requests received by the Hazardous Materials Technical Center operated by Dynamac Corporation. Implemented an efficient methodology for preparing the project expense reports to support program management functions.

The University of Texas at Dallas (1985-1987): Research Assistant

Participated in an environmental assessment and design project which involved the evaluation of the nature and potential impact of hazardous waste. This project included the design of field and laboratory programs for the collection of data used with computer-aided modeling, the site assessment of the proposed hazardous waste facilities, the field sampling and hazardous waste characterization, the zoning of polluted site, the design of remedial cleanup program, and the conceptual design of the hazardous waste disposal plan based on the onsite investigation and computer modeling results.

The University of Texas at Dallas (1984-1985): Computer Laboratory Consultant

Instructed students in microcomputer application and computer programming languages. Conducted scientific data processing and data analysis. Developed a regression analysis program with Lotus 1-2-3. The program integrates five regression mechanisms and takes full advantage of Lotus 1-2-3's keyboard macro and graphic abilities.

The University of Texas at Dallas (1983): Teaching Assistant

Taught numerical analysis and applied mathematics in environmental engineering.

Peitou High School (1979, 1982): Science Teacher

Taught physics, mathematics, computer sciences, and environmental education.

ROC Army (1980-1981): Research Scientist

Conducted environmental surveys and evaluations.

HARDWARE

IBM 360/370., IBM 4341, IBM 4381, IBM PC/XT/AT, IBM PS/2 and compatibles, TI Professional, TI 59, TI 990, and Apple computer family

SOFTWARE

Wylber, Music, CMS, SAS, MS-DOS, CP/M, and various PC-based software systems such as Lotus 1-2-3, DBaseIII+, plus different graphics and data communication utilities; languages used include FORTRAN, BASIC, PL/1, and Pascal

APPENDIX B

OUTSIDE AGENCY CONTACT LIST

OUTSIDE AGENCY CONTACT LIST

Alaskan Department of Environmental Conservation
3601 C Street, Suite 1350
Anchorage, AK 99508
Bruce Erickson and James Hayden, (907) 563-6529

Arctic Environmental Information and Data Center
University of Alaska
707 A Street
Anchorage, AK 99501
L.D. Leslie, (907) 279-4523

National Oceanic and Atmospheric Administration
Office of Hydrology
Grammax Building
8060 13th Street
Silver Spring, MD 20910
(301) 427-7543

National Oceanic and Atmospheric Administration
701 C Street, Box 38
Anchorage, AK 99513
(907) 271-5040

State of Alaska Department of Natural Resources
Division of Geological and Geophysical Surveys
3700 Airport Way
Fairbanks, AK 99709-4609
Mark Robinson (907) 474-7147

U.S. Fish and Wildlife Services
1011 East Tudor Road
Anchorage, AK
Ronald Garrett, (907) 786-3435

U.S. Fish and Wildlife Service
1412 Airport Way
Fairbanks, AK 99701-8524
R.E. (Skip) Ambrose, (907) 456-0239

U.S. Geological Survey
354 Middlefield Road
Menlo Park, CA 94025
Bill Patten, 1-800-521-6586

U.S. Geological Survey
12201 Sunrise Valley Drive
Reston, VA 22092
(703) 648-4000

U.S. Geological Survey
4200 University Drive
Anchorage, AK 99508
Oscar J. Ferrians, Jr., (907) 561-1181

U.S. Soil Conservation Service
201 East 9th Avenue, Suite 300
Anchorage, AK
(907) 271-2424

U.S. Soil Conservation Service
East Fireweed Avenue
Palmer, Alaska 99645
Joe Moore, (907) 745-4274

APPENDIX C

USAF HAZARD ASSESSMENT RATING METHODOLOGY AND GUIDELINES

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The Department of Defense (DoD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DoD facilities. One of the actions required under this program is to:

> develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Preliminary Assessment phase of its Installation Restoration Program (IRP).

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air National Guard in setting priorities for follow-on site investigations.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD program needs.

The model uses data readily obtained during the Preliminary Assessment portion of the IRP. Scoring judgment and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1 of this report). The site rating form and the rating factor guideline are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: possible receptors of the contamination, the waste and its characteristics, the potential pathways for contaminant migration, and any efforts that were made to contain the wastes resulting from a spill.

The receptors category rating is based on four rating factors: the potential for human exposure to the site, the potential for human ingestion of contaminants should underlying aquifers be polluted, the current and anticipated uses of the surrounding area, and the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1,000 feet of the site, and the distance between the site the the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 x factor score subtotal/maximum score subtotal).

The waste characteristics category is scored in three stages. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways: surface-water migration, flooding, and groundwater migration. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned, and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

1. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels: 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence or economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-50	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum c .teria below)	S = Suspected confidence level
o Verbal reports from interviewer (at least 2) or written information from the records	o No verbal reports or conflicting verbal reports and no written information from the records
o Knowledge of types and quantities of wastes generated by shops and other areas on base	Logic based on the knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200° F	Flash point at 140° F to 200° F	Flash point at 80° F to 140° F	Flash point less than 80° F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
70	S	S	L

Notes:

For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level

- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating

- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (including drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay (>10^{-2} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay (<10^{-6} cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall (Number of thunderstorms)	<1.0 inch (0-5)	1.0 to 2.0 inches (6-35)	2.1 to 3.0 inches (36-49)	>3.0 inches (>50)	8

B-2 Potential for Flooding

Rating Factors	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Ground-Water Contamination

Rating Factors	0	1	2	3	Multiplier
Depth to groundwater	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	8
Soil permeability	Greater than 50% clay (<10^{-6} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay (>10^{-2} cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8

B-3 Potential for Ground-Water Contamination -Continued

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Direct access to groundwater (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-6-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX D

PCB CLEARANCE AND FINDING OF NO SIGNIFICANT CONTAMINATION CERTIFICATES FOR GRANITE MOUNTAIN RADIO RELAY STATION, ALASKA

2 DEC 1985

FINDING OF NO SIGNIFICANT CONTAMINATION

GRANITE MOUNTAIN RADIO RELAY SITE

This excess real property contains no known contamination as specified by the Resource Conservation and Recovery Act of 1976 (RCRA), as amended, the Toxic Substance Control Act of 1976, the Comprehensive Environmental Response, Compensation and Liability Act of 1980, the implementing Environmental Protection Agency, federal regulations (40 CFR 261, 262, 263, and 761), and the Federal Property Management Regulations (41 CFR 101).

Bill E. Slone
BILL E. SLONE, WS-13
Chief, Operating Engineers

DESCRIPTION OF SITE:

The parcel of land to be excessed is in NE 1/4, SEC 1, T. 1S., R. 13W., K.R.M. (Candle Quad).

The excess area is more specifically described at **TAB-A** of the Declaration of Excess.

PCB CLEARANCE CERTIFICATE

GRANITE MOUNTAIN RADIO RELAY SITE

This is to certify that a records check and an on-site inspection indicate that this property has been cleared of PCB materials or equipment in accordance with applicable State and Federal laws.

Bill E. Slone

BILL E. SLONE, WS-13
Chief, Operating Engineers

DESCRIPTION OF SITE:

The parcel of land to be excessed is in NE 1/4, SEC 1, T. 1S., R. 13W., K.R.M. (Candle Quad).

The excess area is more specifically described at **TAB-A** of the Declaration of Excess.

APPENDIX E

PHOTOGRAPHS

Photo 1. Temporary Air Terminal, Temporary Auto Storage Building, 55-gallon drums (behind aircraft), and abandoned bulldozer viewed southwest.

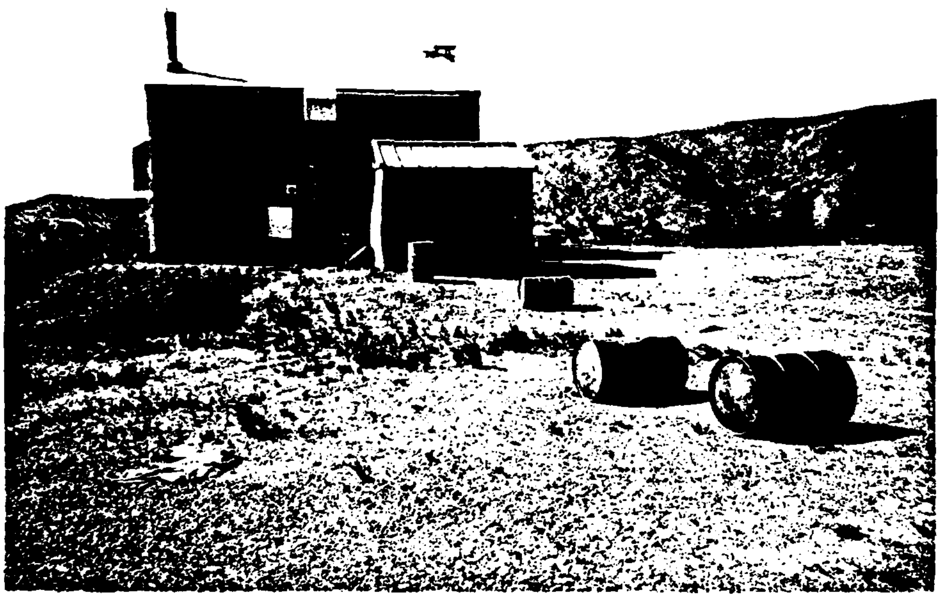

Photo 2. Temporary Auto Storage Building and adjacent storage building with 55-gallon drums viewed west.

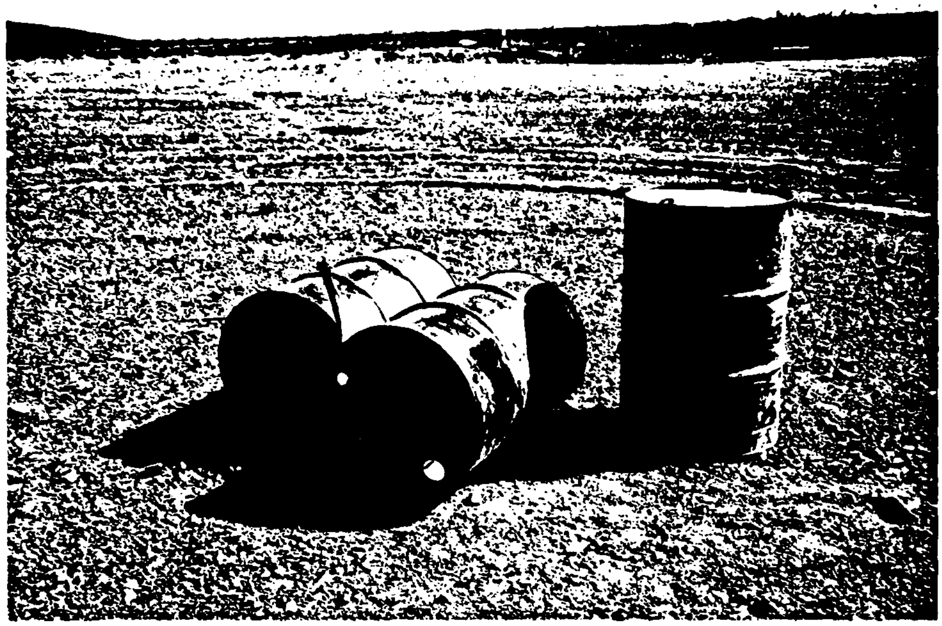

Photo 3. 55-gallon drums east of the Temporary Auto Storage Building viewed south.

Photo 4. 55-gallon drum located between the Temporary Auto Storage Building and the storage building viewed northeast.

Photo 5. 55-gallon drums inside and outside of the storage building viewed southeast.

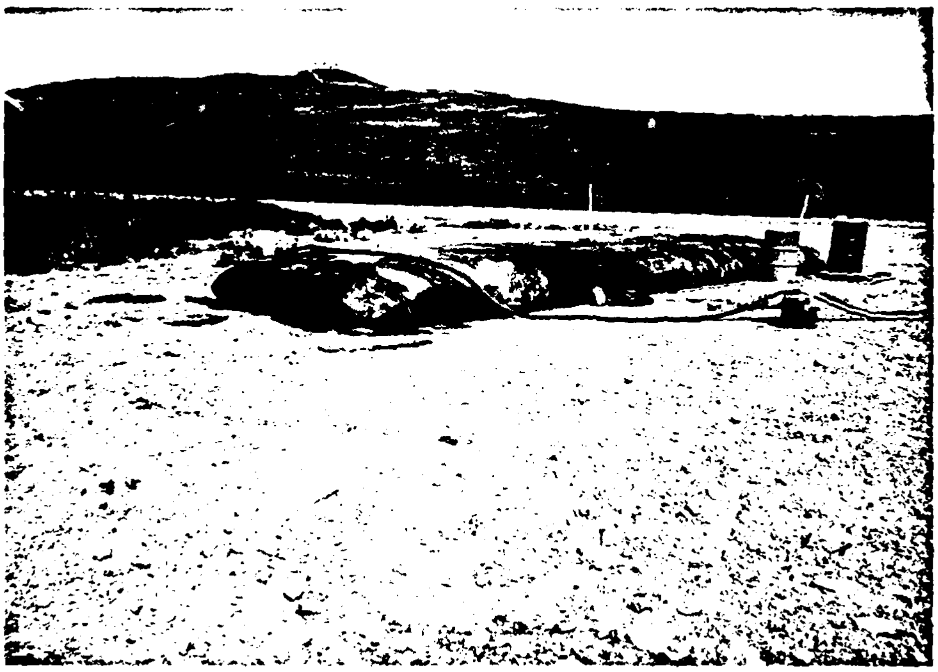

Photo 6. Fuel bladder adjacent to runway viewed northeast.

Photo 7. Fuel storage tank and associated piping east of the runway viewed east.

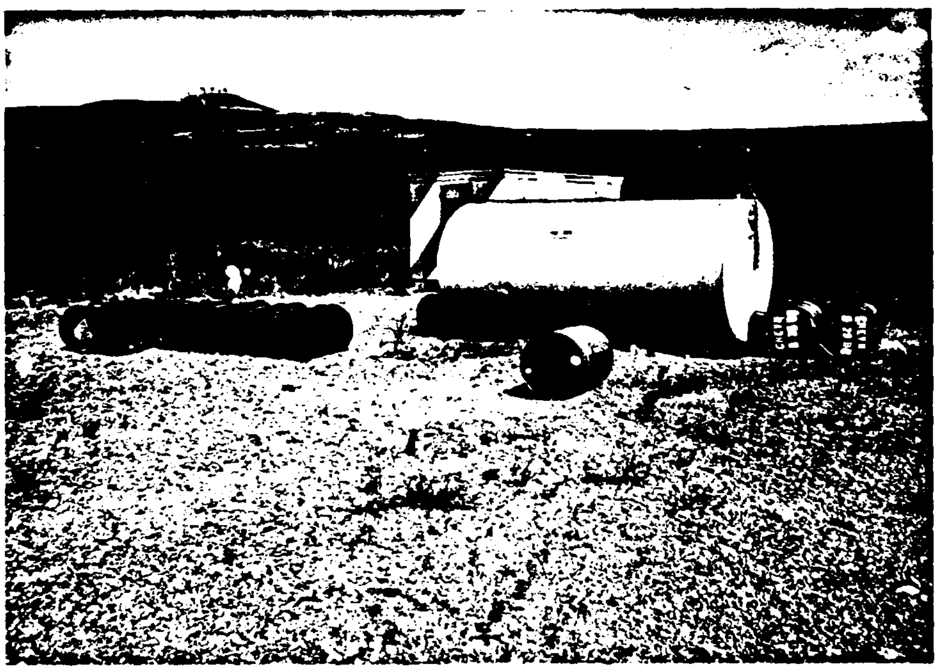

Photo 8. Fuel storage area east of the runway viewed northeast.

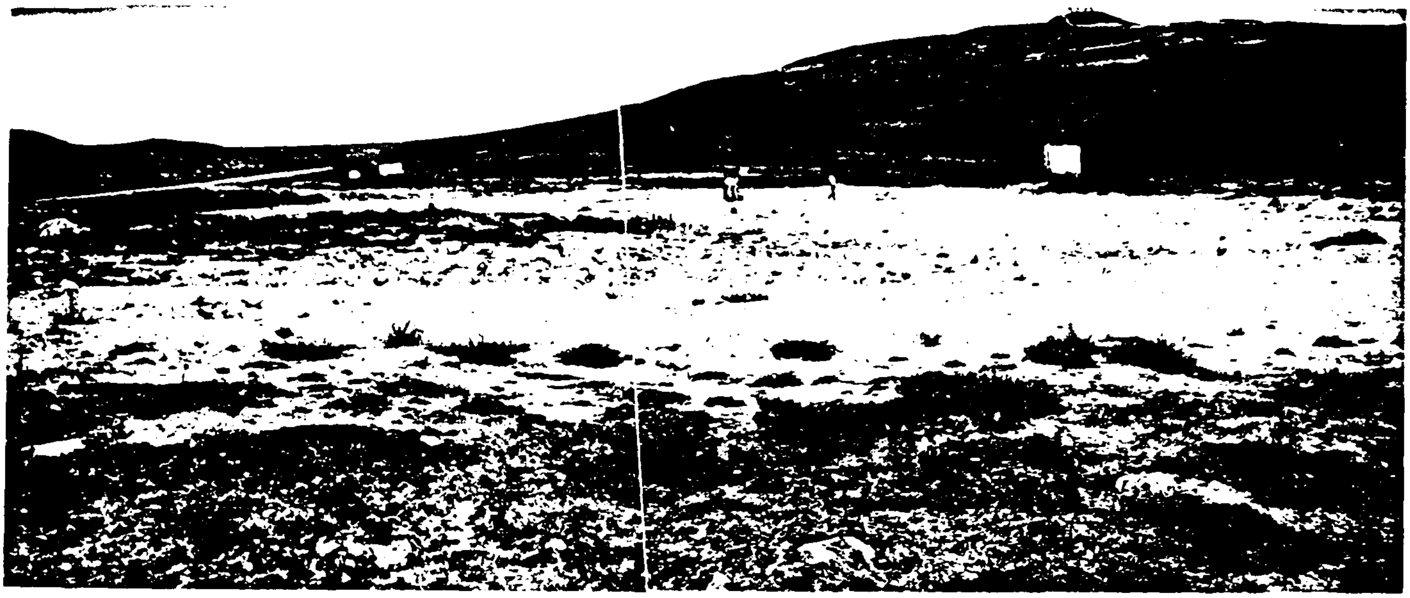

Photo 9. Cleaned drum disposal area east of runway viewed north.

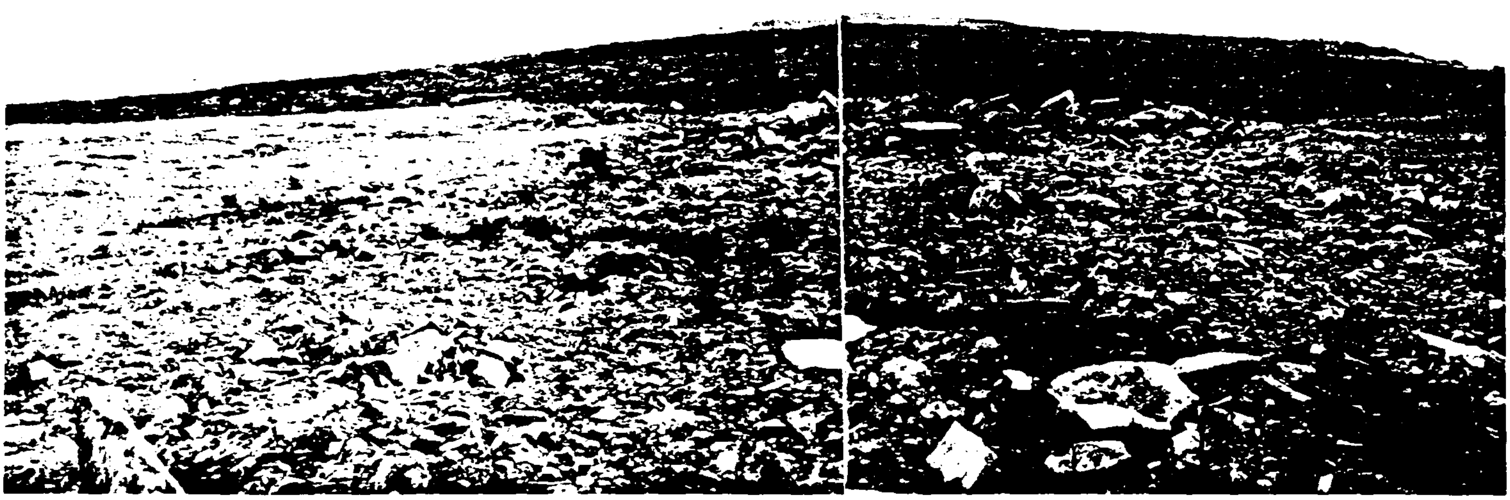

Photo 10. Cleaned disposal area southwest of the communications facility viewed south.

Photo 11. Disposal area located southeast of the communications facility viewed east.

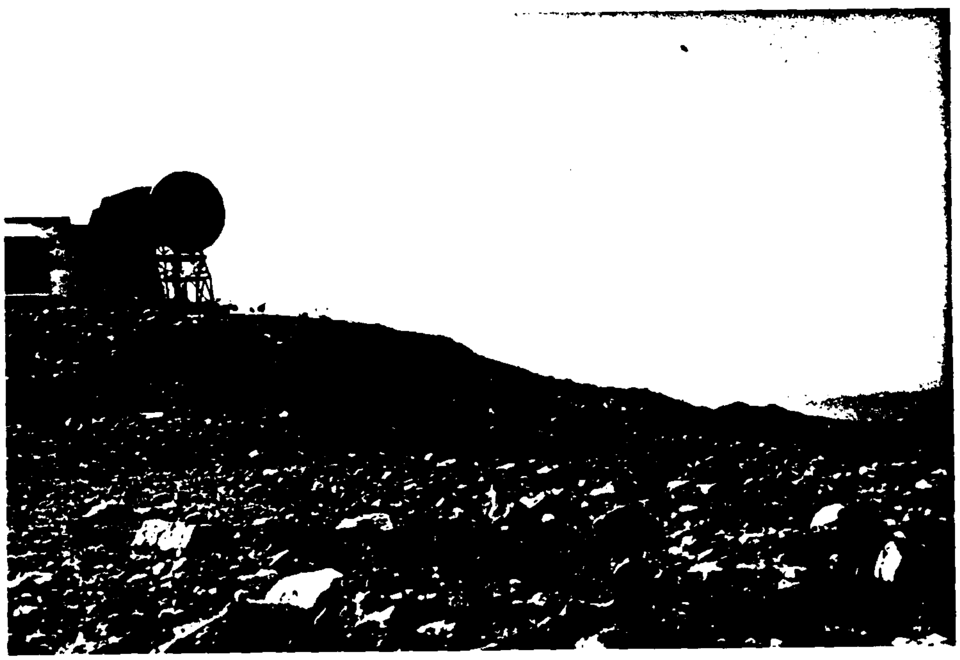

Photo 12. Cleaned disposal area northwest of the communications facility viewed south.

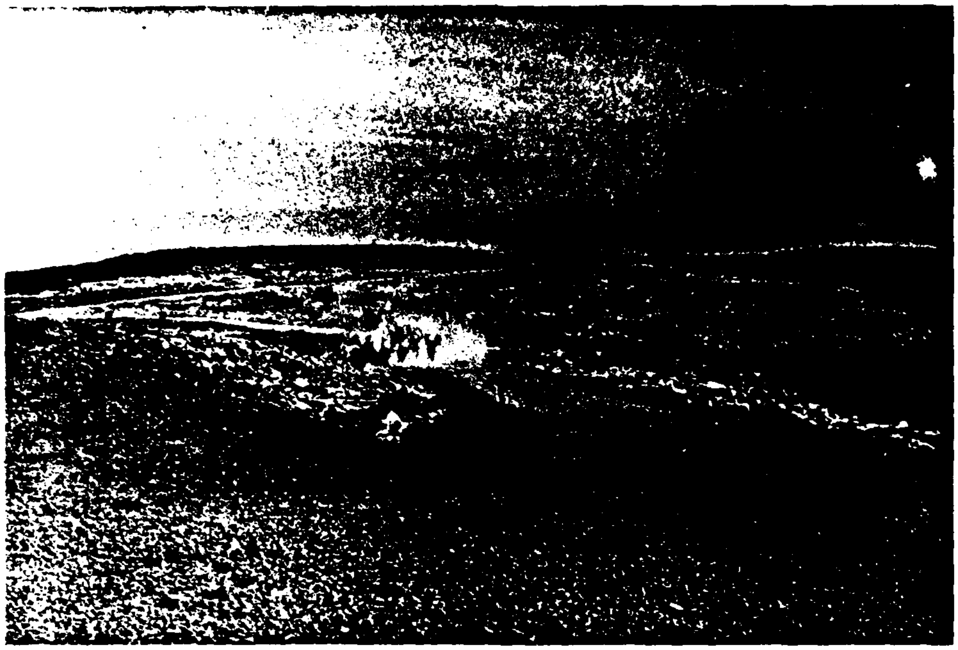

Photo 13. Cleaned disposal area north of the communications facility viewed north.

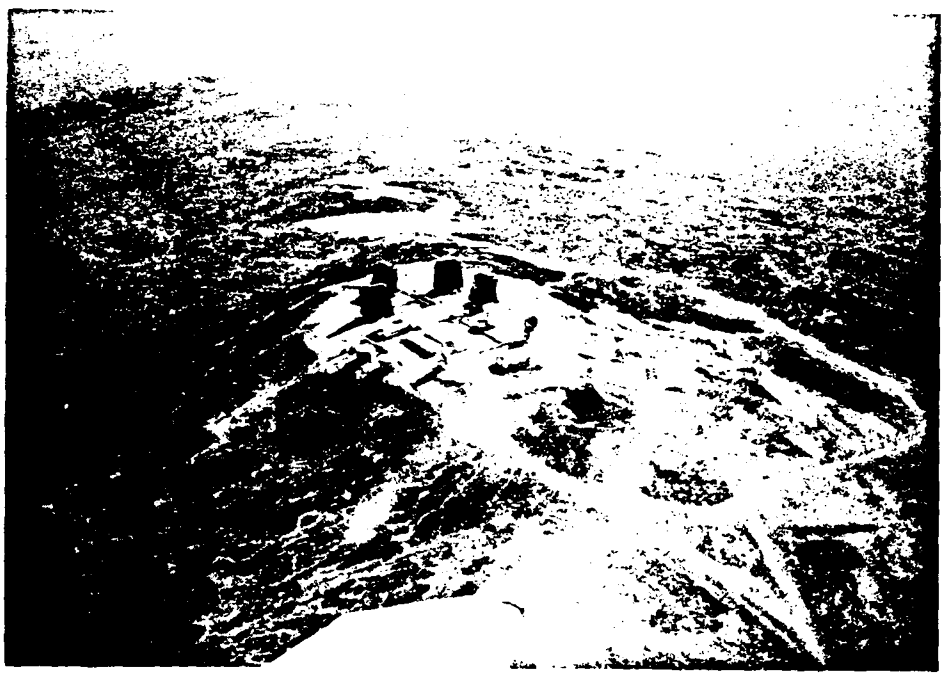

Photo 14. Oblique aerial photograph of Granite Mountain RRS.

Photo 15. Oblique aerial photograph of Granite Mountain RRS.